DISNEY • PIXAR
SPECIAL EDITION

13GB OF FREE ASSETS
VIDEOS, MODELS & MORE

www.3DArtistonline.com

82

3DArtist™

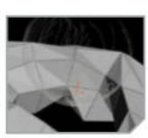
Practical inspiration for the 3D community

Disney • PIXAR MASTERCLASS

29 pages of studio insight • RenderMan 20 explained • Unprecedented access

PLUS EXCLUSIVE PIXAR TUTORIAL

SCULPT IN ZBRUSH
Craft a fantasy knight



DISCOVER HOUDINI
Incredible sphere FX

MAYA RIGGING
Blend IK and FK modes

ip IMAGINE PUBLISHING
DigitalEdition
GreatDigitalMags.com
ISSUE 082

da Vinci Junior

Only £239.95!
(exc VAT)

XYZprinting
3D Printing Made Easy!

No more stressing over calibration

Calibrating your 3D printer can be more than difficult. With the da Vinci Jr., you no long have to worry about it. This simple, intuitive 3D printing system requires no calibration.

New auto-loading filament system

Make loading and replacing your filament fast and easy. The da Vinci Jr. features a new auto-loading filament system to make your 3D printing experience more convenient.

New press-and-release extruder

The da Vinci Jr. offers a fluid press-and-release extruder, making it easy for you to replace your 3D printer extruder. Simply open up the da Vinci Jr., press the release button, and replace the extruder within a few seconds.

Economically safe

New PLA filament is available for use with the da Vinci Junior. This filament is non-toxic, biodegradeable plastic that is recyclable and safe for the environment.

Energy Efficient

Due to its compact design, the da Vinci Jr. only uses 75 watts of power. This eco-friendly 3D printer helps you conserve material and resources, while you're learning and creating new things.

Perfect 3D printing solution at home and in school

The da Vinci Junior was built with safety in mind. It has a completely enclosed design with a non-heated print tray, which is perfect for new 3D printing users. It is a 3D printer that everyone can enjoy!

Use coupon code **"ARTIST"** and get **5% off**

- Robust build size of 5.9" x 5.9" x 5.9"
- Resolution of 100 to 400 microns
- It's smart and easy-to-use
- It's Safe and Green – PLA filament is non-toxic, biodegradable plastic that is recyclable and safe for the environment
- Energy efficient, consumes only 75 watts of power
- No calibration required
- Auto-loading filament system
- Easy replaceable extruder
- Replacement material is very affordable

Place an order online or call us for a school quote. We accept school purchase orders.

www.studica.com **+44 (0) 20 8596 8036**

Discover the secrets of Inside Out Page 24

> Tony Fucile, who's a great animator, would come in and do sketches and drawings over our work to 'plus' it; to make us think outside of the model

Shawn Krause on how Pixar approached *Inside Out* a little differently **Page 24**

Everything you need to know about RenderMan **Page 34**

Welcome

To the magazine and 100 pages of amazing 3D

Welcome to a very special edition of **3D Artist**! "But every issue is a special issue!" I hear you cry. True enough, but this one is particularly special. This month, we've been granted unprecedented access to one of the true greats of our industry, Pixar. Throughout the issue you'll find 29 pages of incredible Pixar content, ranging from a behind-the-scenes look at the animation giant's new picture *Inside Out*, to its latest short 'Lava', to an in-depth look at RenderMan and why it's such a special tool. And if that wasn't enough, we've been lucky enough to get our hands on an exclusive step-by-step tutorial written by Dylan Sisson of Pixar, in which he walks you through a world-class rendering workflow in RenderMan. It's great content and I really hope that you all enjoy it.

Of course, we have more up our sleeves than just *the biggest animation studio in the world*. On p54, Thiago Lima reveals his incredible workflow for blending photography with 3D – his lighting work in particular is insane and needs to be seen to be believed. We've also got Andreas E Hopen with some ZBrush sculpting, Jahirul Amin more than justifying his considerable reputation with a rigging masterclass, Niels Prayer with some Houdini trickery and a really useful videogame rig from Thiago Vidotto. Enjoy!

Steve Holmes, Deputy Editor

Sign up, share your art and chat to other artists at **www.3dartistonline.com**

Get in touch... 3dartist@imagine-publishing.co.uk @3DArtist Facebook.com/3DArtistMagazine

3D Artist

Imagine Publishing Ltd
Richmond House, 33 Richmond Hill
Bournemouth, Dorset BH2 6EZ
☎ +44 (0) 1202 586200
Web: www.imagine-publishing.co.uk
www.3dartistonline.com
www.greatdigitalmags.com

Magazine team

Deputy Editor Steve Holmes
stephen.holmes@imagine-publishing.co.uk
☎ 01202 586248
Editor in Chief Dan Hutchinson
Features Editor Larissa Mori
Production Editor Carrie Mok
Senior Designer Chris Christoforidis
Photographer James Sheppard
Senior Art Editor Will Shum
Publishing Director Aaron Asadi
Head of Design Ross Andrews

Contributors
Jahirul Amin, Orestis Bastounis, James Clarke, Andreas E Hopen, Thiago Lima, Niels Prayer, Dylan Sisson, Thiago Vidotto

Advertising
Digital or printed media packs are available on request.
Head of Sales Hang Deretz ☎ 01202 586442
hang.deretz@imagine-publishing.co.uk
Advertising Manager Alex Carnegie ☎ 01202 586430
alex.carnegie@imagine-publishing.co.uk
Account Manager Simon Hall ☎ 01202 586415
simon.hall@imagine-publishing.co.uk

FileSlio.co.uk
Assets and resource files for this magazine can be found on this website. Register now to unlock thousands of useful files. Support: filesilohelp@imagine-publishing.co.uk

International
3D Artist is available for licensing. Contact the International department to discuss partnership opportunities.
Head of International Licensing Cathy Blackman
☎ +44 (0) 1202 586401
licensing@imagine-publishing.co.uk

Subscriptions
To order a subscription to **3D Artist**:
☎ UK 0844 249 0472
☎ Overseas +44 (0) 1795 592951
Email: 3dartist@servicehelpline.co.uk
6-issue subscription (UK) – £21.60
13-issue subscription (UK) – £62.40
13-issue subscription (Europe) – £70
13-issue subscription (ROW) – £80

Circulation
Head of Circulation Darren Pearce ☎ 01202 586200

Production
Production Director Jane Hawkins ☎ 01202 586200

Finance
Finance Director Marco Peroni

Founder
Group Managing Director Damian Butt

Printing & Distribution
Printed by William Gibbons & Sons Ltd, 26 Planetary Road, Willenhall, West Midlands, WV13 3XT

Distributed in the UK, Eire & the Rest of the World by Marketforce, Blue Fin Building, 110 Southwark Street, London SE1 0SU
☎ 0203 148 3300, www.marketforce.co.uk

Distributed in Australia by Network Services (a division of Bauer Media Group), Level 21 Civic Tower, 66-68 Goulburn Street, Sydney, New South Wales 2000, Australia ☎ +61 2 8667 5288

Disclaimer
The publisher cannot accept responsibility for any unsolicited material lost or damaged in the post. All text and layout is the copyright of Imagine Publishing Ltd. Nothing in this magazine may be reproduced in whole or part without the written permission of the publisher. All copyrights are recognised and used specifically for the purpose of criticism and review. Although the magazine has endeavoured to ensure all information is correct at time of print, prices and availability may change. This magazine is fully independent and not affiliated in any way with the companies mentioned herein. If you submit material to Imagine Publishing via post, email, social network or any other means, you automatically grant Imagine Publishing an irrevocable, perpetual, royalty-free license to use the material across its entire portfolio, in print, online and digital, and to deliver the material to existing and future clients, including but not limited to international licensees for reproduction in international, licensed editions of Imagine products. Any material you submit is sent at your risk and, although every care is taken, neither Imagine Publishing nor its employees, agents or subcontractors shall be liable for the loss or damage.

© Imagine Publishing Ltd 2015
ISSN 1759-9636

IMAGINE PUBLISHING

recycle
When you have finished with this magazine please recycle it

NVIDIA® QUADRO® ACCELERATE YOUR CREATIVITY.

Accelerate your creativity with NVIDIA® Quadro®— the world's most powerful workstation graphics.

Whether you're developing revolutionary products or telling spectacularly vivid visual stories, Quadro gives you the performance to do it brilliantly.

NVIDIA Quadro K6000 VCQK6000-PB	
NVIDIA Quadro K5200 VCQK5200-PB	
NVIDIA Quadro K5000 MAC VCQK5000MAC-PB	
NVIDIA Quadro K4200 VCQK4200-PB	

NVIDIA Quadro K2200 VCQK2200-PB	
NVIDIA Quadro K2000DVI VCQK2000DVI-PB	
NVIDIA Quadro K620 VCQK620-PB	
NVIDIA Quadro K420 VCQK420-PB	

Learn more **www.pny.eu/quadro** & **pny.quadrok-selector.com**

Insight
uk.insight.com
Tel: 0844 846 3333

Misco
www.misco.co.uk
Tel: 0800 038 8880

Dabs.com
www.dabs.com
Tel: 0870 429 3825

Scan Computers
www.scan.co.uk
Tel: 0871 472 4747

PNY® Professional Solutions

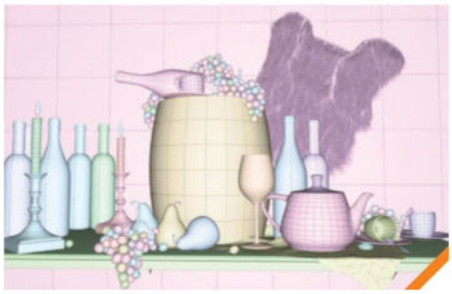
NVIDIA Quadro® / Tesla® / GRID™ / Prevail SSD

NVIDIA.

© 2014 NVIDIA Corporation. All rights reserved. NVIDIA, the NVIDIA logo, and Quadro are trademarks and/or registered trademarks of NVIDIA Corporation. All company and product names are trademarks or registered trademarks of the respective owners with which they are associated.

The Expert Panel

This issue's team of pro artists...

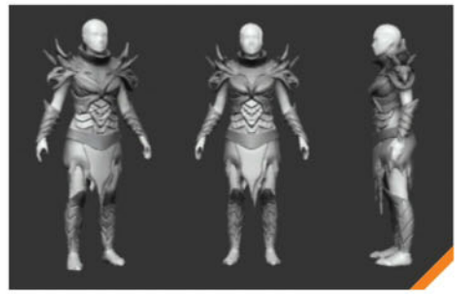


DYLAN SISSON
renderman.pixar.com

We're extremely excited to have Dylan join us this month – over on p46 he teaches you how to create still life in RenderMan. Did you know he's the man who animated the RenderMan teapot?
3DArtist username dylan.sisson

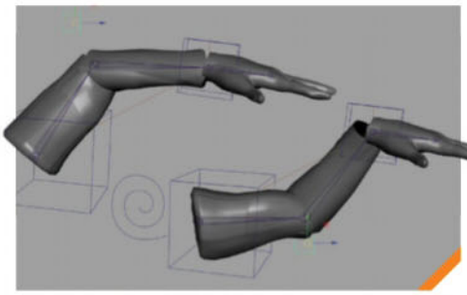
THIAGO LIMA
thilima.com.br

You may have seen Thiago's work before now – he produces incredible pieces of art by combining model photography with superb 3D environments. His tutorial begins on p54.
3DArtist username thilima3d



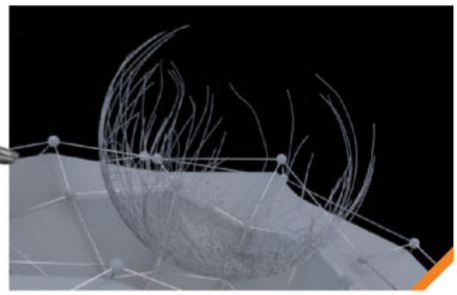
ANDREAS E HOPEN
andreashopen.com

Sculpting anatomy and then armour over the top can be a messy task, but luckily, over on p64 Andreas reveals his sculpting workflow for creating a knight character using ZBrush.
3DArtist username Hopen



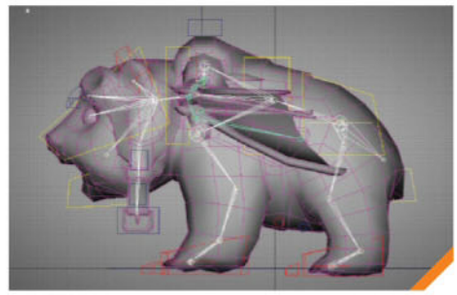
JAHIRUL AMIN
jahirulamin.com

It's great to have Jahirul back for this issue. This month he returns with his unrivalled Maya expertise to demonstrate how to blend FK and IK mode while rigging. His tutorial starts over on p70.
3DArtist username n/a



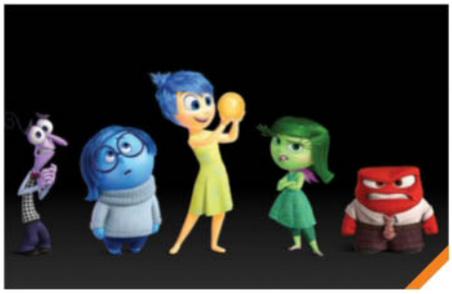
NIELS PRAYER
nielsprayer.com

Houdini is a really awesome tool that we don't cover nearly enough, so this month we've drafted in Niels to show you how to create an amazing particle system for motion design. You'll find it on p74.
3DArtist username nielsprayer



THIAGO VIDOTTO
tvidotto.com

Rigging can often be a laborious, time-consuming task. However, Thiago is on hand to show you how to put together a nice quick rig for a videogame character in his tutorial on p78.
3DArtist username n/a



JAMES CLARKE
twitter.com/jasclarkewriter

This issue James has investigated the ins and outs of *Inside Out*, the latest movie from Disney Pixar. Find out all about how the film was put together in his feature over on p24.
3DArtist username n/a

LARISSA MORI
3dartistonline.com

This month, Larissa spoke to several key figures from the RenderMan team to find out more about the upcoming RenderMan 20 and the history of the software. Her feature begins on p46.
3DArtist username Larissa_3D Artist

ORESTIS BASTOUNIS
twitter.com/mrbastounis

Rather than having to send him a massive box as usual, this month we had something comparitively small sent to Orestis – the Fujitsu Celsius H730 mobile workstation. His verdict is on p82.
3DArtist username n/a

OVERCLOCKERS UK
www.overclockers.co.uk

RENDA

PROFESSIONAL WORKSTATIONS

8 PACK
GLOBAL #1 OVERCLOCKER

5 YEAR WARRANTY • BUILT & STRESS TESTED • CONFIGURABLE • ENGINEERED BY THE EXPERTS

Working with 8PACK Global #1 Overclocker

It all starts with a blank canvas

www.overclockers.co.uk/renda

Frequency Enhanced workstations featuring Windows 8.1

Overclockers UK | Unit 5 Lymedale Cross, Newcastle-under-Lyme, Staffordshire, ST5 9BT

Prices correct at time of print but may change without prior notice. All items subject to availability. Specification may vary.
Intel, the Intel Logo, Intel Inside, Intel Core, and Core Inside are trademarks of Intel Corporation in the U.S. and/or other countries.

Contents

What's in the magazine and where

News, reviews & features

10 The Gallery
A hand-picked collection of incredible artwork to inspire you

22 Technique focus: Joy
Find out why the main emotion in *Inside Out* was a challenge for Pixar

24 Code to Joy: The Making of Pixar's Inside Out
James Clarke speaks to several key Pixar staff about how the team put together the emotional rollercoaster

32 Technique focus: Fear
Story supervisor Josh Cooley explains how Fear interacts with Joy

34 To RenderMan 20 and Beyond
A few months after it went free for non-commercial users, RenderMan is on the brink of a new release. Find out from Pixar just how incredible it is

42 Inside 'Lava': An Interview with Jim Murphy
The director of Pixar's latest short reveals how a dedicated idea developed into a stunning volcanic love story

44 Technique focus: Sadness
Co-director Ronnie del Carmen explains Joy's relationship of misunderstanding with her opposite number

62 Technique focus: Disgust
Discover how Disgust went from beast to beauty, in looks and personality

81 Technique focus: Anger
Learn more about the unique particle effects on display in *Inside Out*

82 Review: Fujitsu Celsius H730
Orestis Bastounis puts a mobile workstation through its paces

84 Review: CadMouse
Find out what Jahirul Amin thought of this mouse, built with 3D in mind

85 Review: The Beginner's Guide to Character Creation in Maya
Discover our verdict on the latest tutorial book from 3DTotal

86 Subscribe today!
Save money and never miss an issue by picking up a subscription

The making of Inside Out

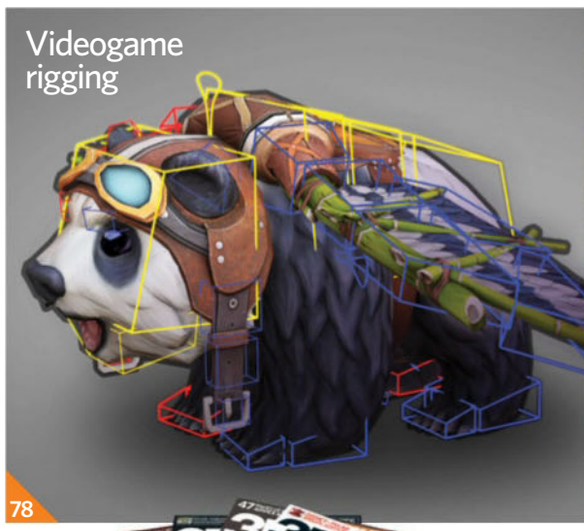
"There is some of the most subtle, human, expressive animation we've ever done here"

Shawn Krause on why *Inside Out* is so special **Page 27**

24

Sculpt a dark knight in ZBrush

64

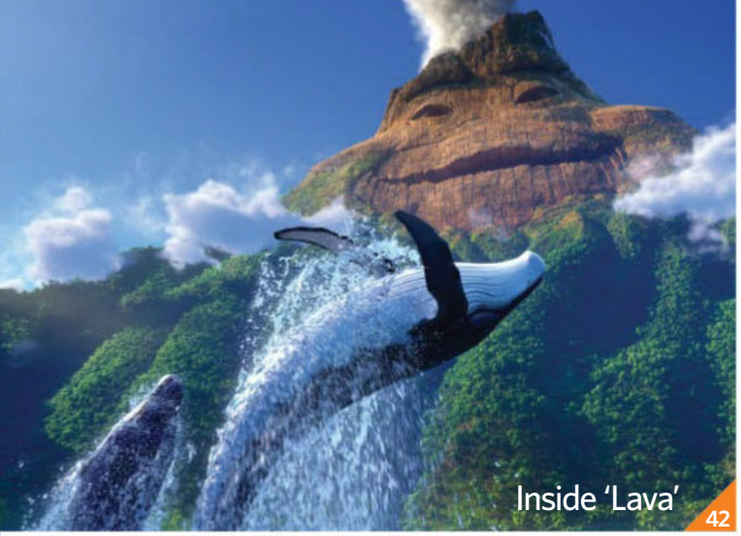


Videogame rigging

78

TRY 5 ISSUES FOR £5*
SUBSCRIBE TODAY

Turn to page 86 for details



"People are now starting to use cheats to light their characters which are actually inspired by real-life cheats"
Julian Fong talks RenderMan Page 37
RNDRMAN
34

The Pipeline

46 Step by step: Create still life with RenderMan
Dylan Sisson of Pixar teaches you how to create and render a stunning, artistic scene

54 Step by step: Blend photos and 3D realistically
Discover how Thiago Lima creates such unique and convincing portrait pieces through clever compositing

64 Step by step: Sculpt a dark knight in ZBrush
Learn how to make a detailed fantasy knight with Andreas Hopen

70 Pipeline techniques: Rigging with FK and IK
Jahirul Amin explains crucial techniques for creating a rig that uses both modes

74 Pipeline techniques: Master a particle effects system
Create awesome abstract effects in Houdini with Niels Prayer

78 Pipeline techniques: Build a quick rig for videogame characters
Thiago Vidotto shows you how to prepare your characters for animation quickly

DOWNLOAD FROM THE FileSilo

- 2+ hours of ZBrush videos from Digital-Tutors
- Premium CGAxis models worth over $90
- A selection of HDRIs courtesy of HDRI Hub
- 25 3DTotal textures

Turn to **page 96** for the complete list of this issue's **free downloads**
filesilo.co.uk/3dartist

Visit the **3D Artist** online shop at
imagineshop.co.uk
for back issues, books and merchandise

The Hub

90 Community news
The run up to BFX Festival has begun – find out what's going on, where it's happening and where you can buy tickets

92 Industry news
Discover our latest title, **3D Make & Print**, and updates to MODO and KATANA from The Foundry

94 Readers' gallery
The **3DArtistOnline.com**'s community art showcase

The Gallery

Have an image you feel passionate about? Get your artwork featured in these pages
Create your gallery today at **www.3dartistonline.com**

Viktor Fretyán
radicjoe.cgsociety.org

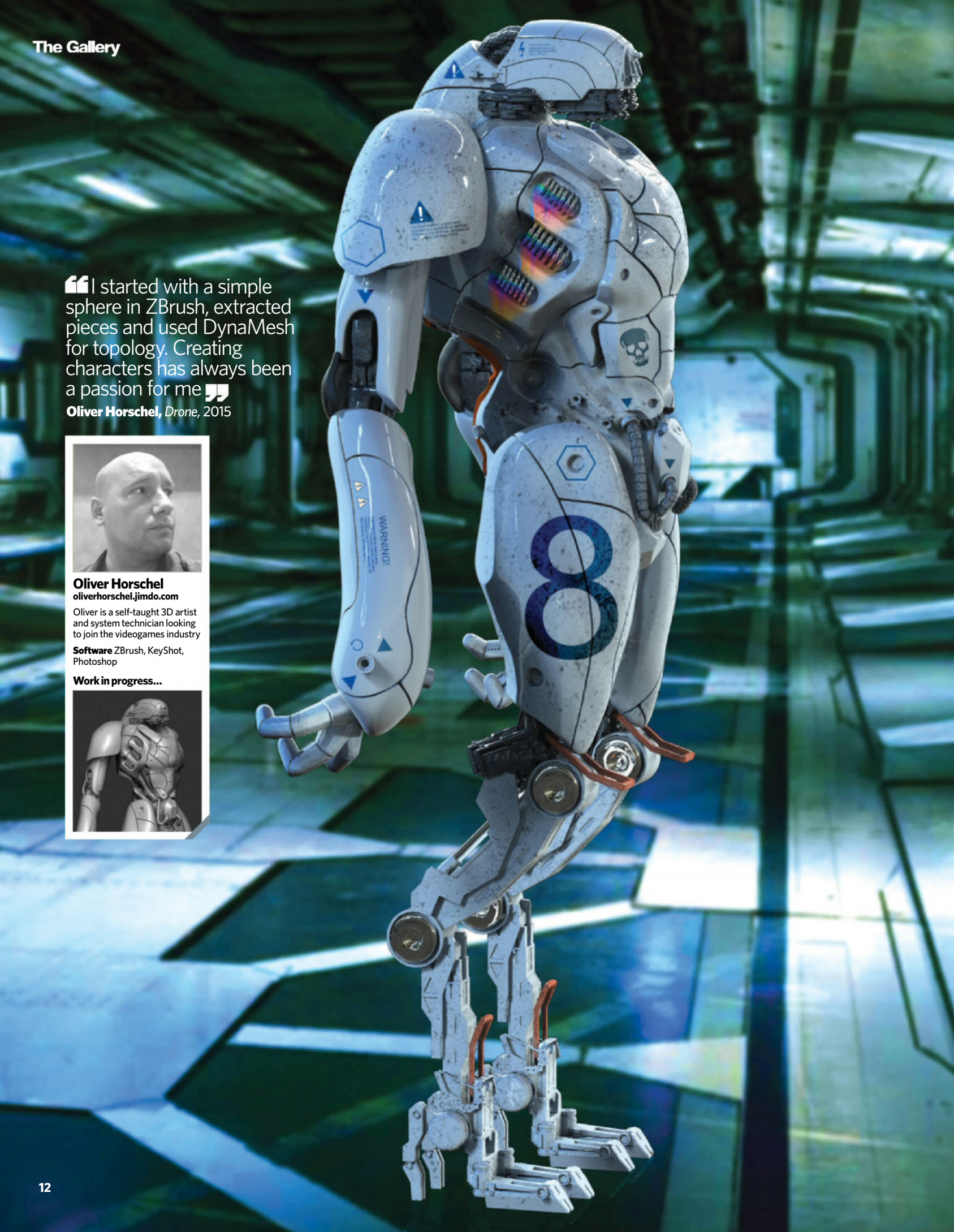
Originally from Hungary, Viktor is a freelance architect who has worked for MIR in Norway

Software V-Ray, 3ds Max, Photoshop

Work in progress...

"This image was made for Franz Architekten. Architects hate shadows, but it is important to understand that dark areas make the sunny parts shine!"

Viktor Fretyán, *Courtyard,* 2014



"I started with a simple sphere in ZBrush, extracted pieces and used DynaMesh for topology. Creating characters has always been a passion for me"

Oliver Horschel, *Drone,* 2015

Oliver Horschel
oliverhorschel.jimdo.com

Oliver is a self-taught 3D artist and system technician looking to join the videogames industry

Software ZBrush, KeyShot, Photoshop

Work in progress...

Arda Koyuncu
ardakoyuncu.com

3DArtistOnline username: qoyun

Software 3ds Max, MARI, ZBrush, V-Ray, Ornatrix

Work in progress...

"I carefully studied my references and broke the make-up down into layers for more control. I used MARI to hand paint a black-and-white mask for the base make-up layer"

Arda Koyuncu, *Fat Aristocrat,* 2014

Ryan Coyoca
4thlight.com

3DArtistOnline username: screamice

Software 3ds Max, Corona, Photoshop

Work in progress...

"This was created in 3ds Max and rendered using Corona. The scene was lit with an HDRI, while the depth of field and the subtle volumetric lighting effect were both baked in the render"

Ryan Coyoca, *Outdoor Dining,* 2015

Artem 'Archy' Gansior
gansior.artstation.com

With a passion for character work, Artem works as art director for Gamanoid TV

Software 3ds Max, Corona, After Effects

Work in progress...

"This image was inspired by articles on cinematography and colour. PF Spliner and Particle Flow helped me make chaotic splines without modelling. I also used a simple script by Voronoi for object defragmentation"

Artem 'Archy' Gansior, *Powerless,* 2015

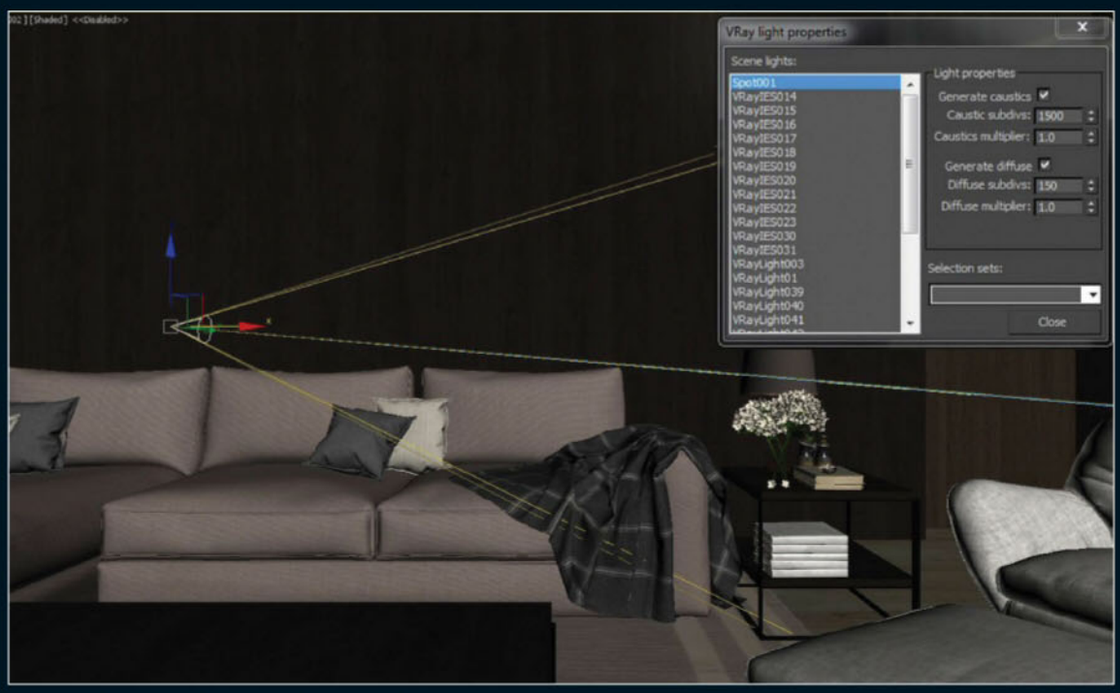
Valkyrie Studio
valkyrie-s.com

As visualisation artists based in Bangkok, Valkyrie Studio specialise in 3D graphic arts

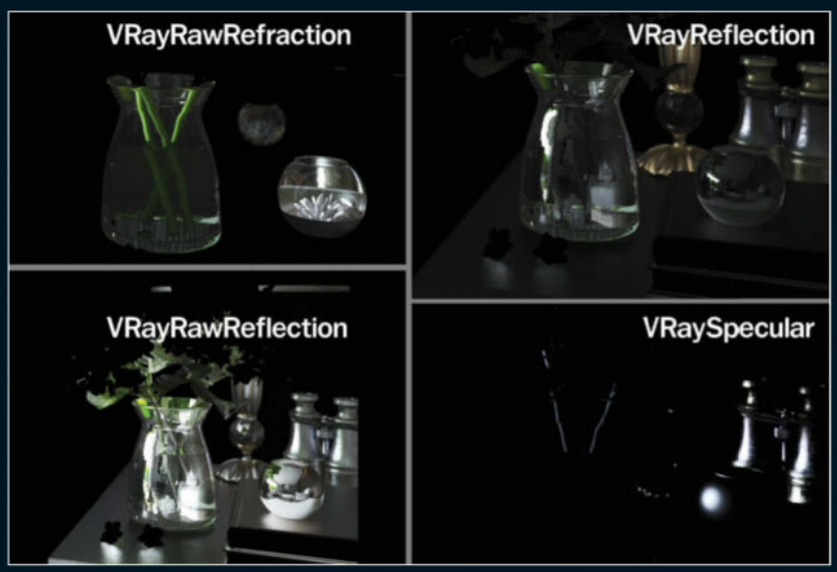
Software 3ds Max, V-Ray, Photoshop

Work in progress...

"If you want to create a beautiful image, you really need to pay attention to the small objects in the scene. This vase of flowers is the perfect example"
Valkyrie Studio, *Hydrangea,* 2014

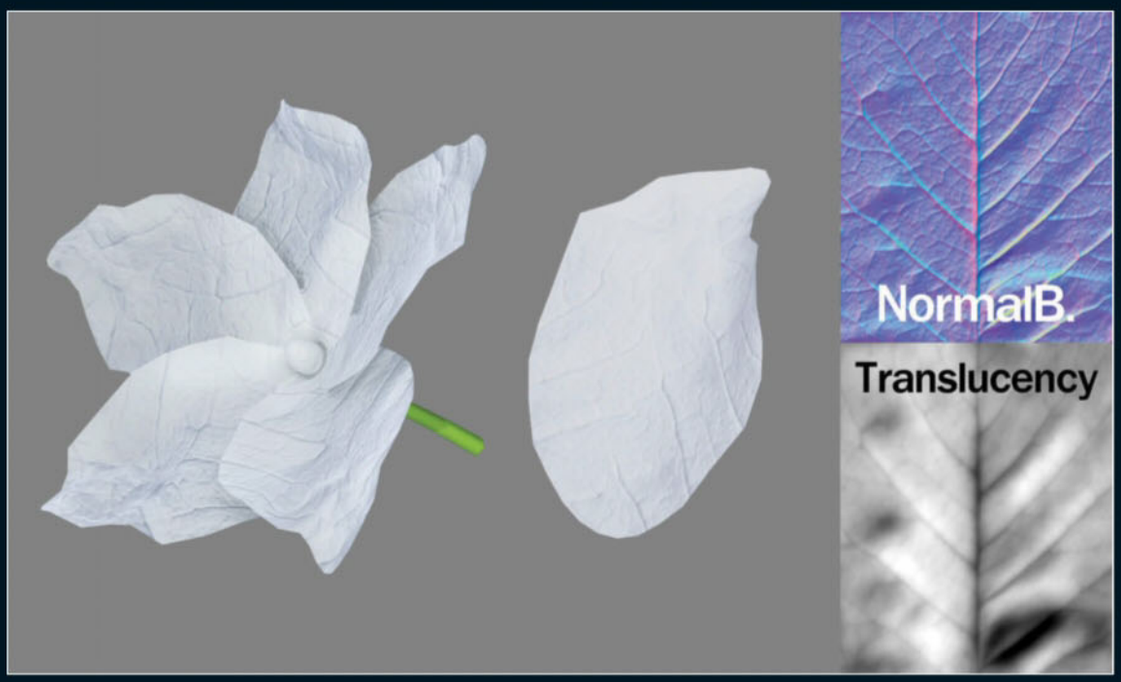


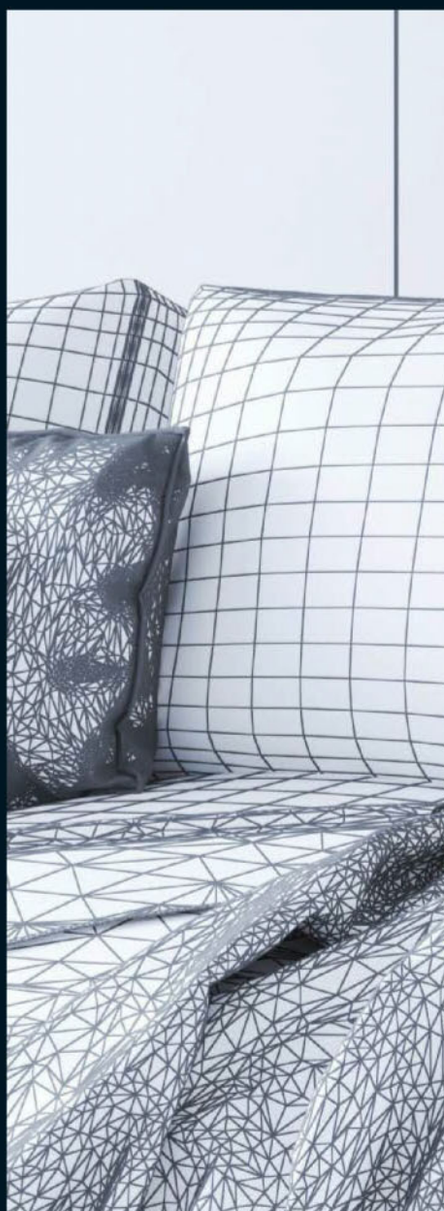
MATERIAL
TOP The glass material is actually just a simple V-Ray material. We have a fake caustic created by using a spotlight for the caustic only; postproduction was done in Photoshop.

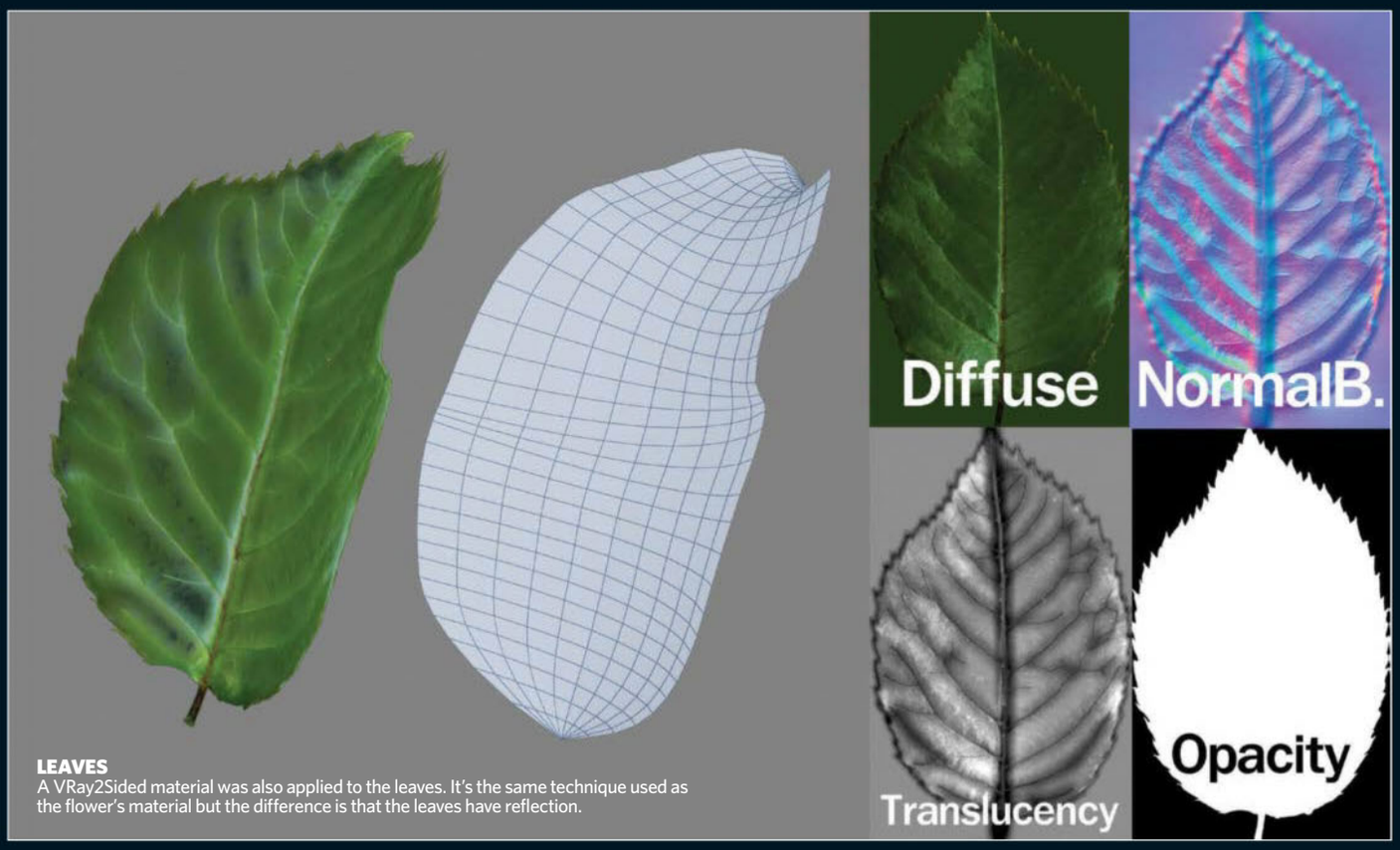


REFLECTION
RIGHT We used V-Ray Render Elements to enhance the final reflections in Photoshop.

FLOWER
BELOW The Hydrangea's flowers were created using simple planes, which then had a VRay2Sided material with textures applied to them. By making a large amount of flowers, the simple planes will start to look realistic.







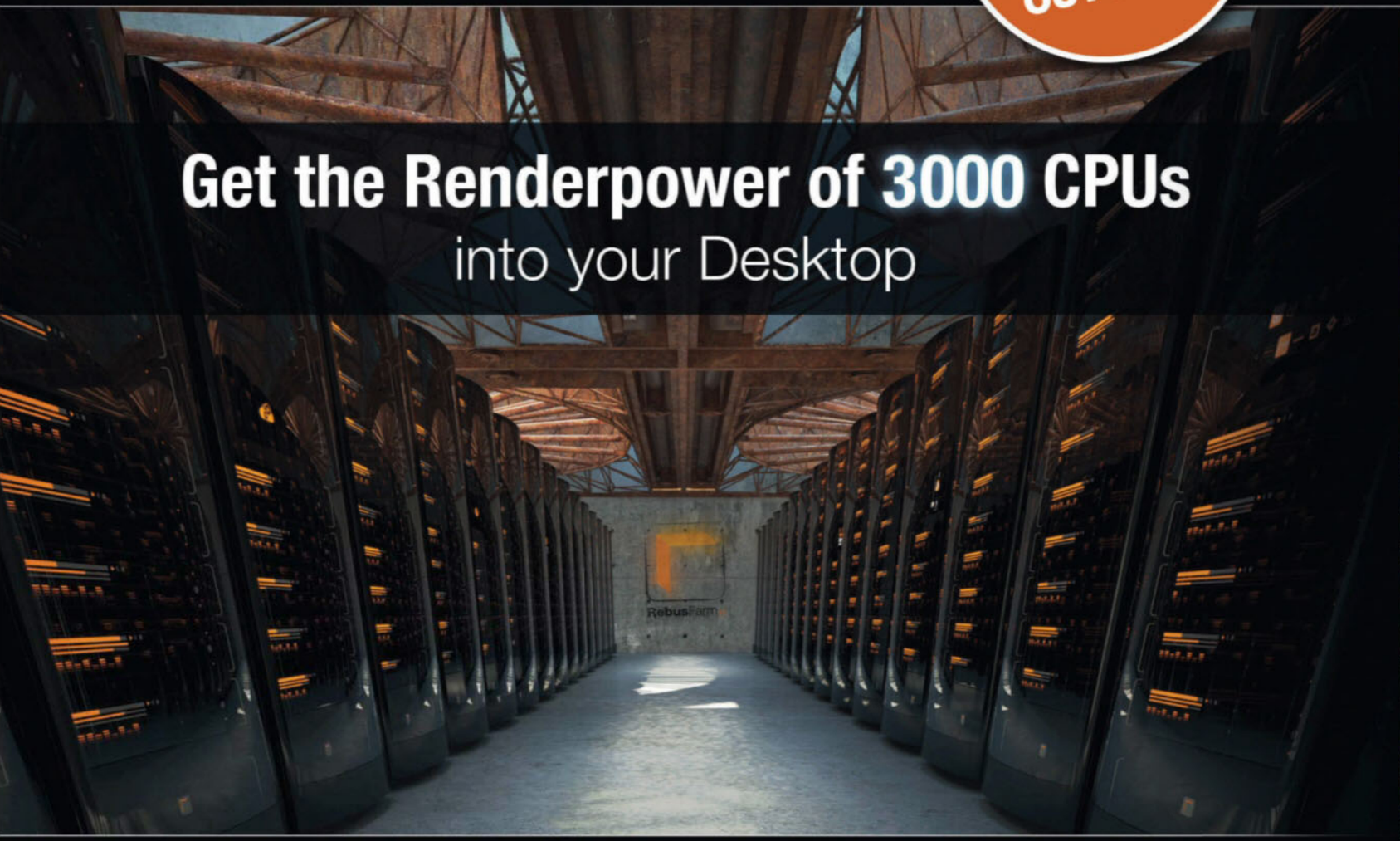
LEAVES
A VRay2Sided material was also applied to the leaves. It's the same technique used as the flower's material but the difference is that the leaves have reflection.

> By making a large amount of flowers, the simple planes will start to look realistic
>
> **Valkyrie Studio,** *Hydrangea,* 2014

RebusFarm
Render Service

2.0
OUT NOW !

Get the Renderpower of 3000 CPUs
into your Desktop



Making your deadline in time was never cheaper,
easier and faster than now!

- Best price
- No waiting time
- Advanced apps and plugins
- All major software packages supported
- 24/7 processing and support

35€
Free Trial
Only for new registrants.
Bonus Coupon Code:
3DA-RE-279XY7PY

www.RebusFarm.net

Rendered at RebusFarm
Render Service

Image by **Yvan Feusi** (http://aiven.net)

"Pirate Island" was created by Yvan Feusi a freelance art director, 2D/3D artist and web-designer from Switzerland. He started self-taught in 2003, immediately got passionate and worked on multiple art projects for a few years, experimenting with 3D programs, photography, drawing, etc.

"Pirate Island" was created with Cinema 4D and Photoshop. Yvan designed a very detailed and great-looking pirate world, which you can also download as a desktop wallpaper.

Yvan Feusi on the render process: "Render speed could have become an issue with the deadline on this project. Thankfully the ease of use of RebusFarm allowed me to quickly upload the scene directly from their Cinema4D plugin. I rendered with GI/AO and it only took 1h30 for their 100 servers to render the final high-res picture. Amazing!"

See more projects from Yvan Feusi on Aiven.net

Technique focus

Incredible 3D artists take us behind their artwork

JOY Riley's most important emotion, Joy, was the hardest of the *Inside Out* emotion characters to get right for the team over at Pixar. Even though she was a happy character, she couldn't always be happy as that would make her less well rounded and may even have been annoying to the audience to watch.

WS-X ENHANCED WORKSTATION

BUILT FROM THE GROUND UP FOR OPTIMISED PERFORMANCE AND ROCK SOLID RELIABILITY

BUILT FOR PROS WITH INTEL INSIDE ®

CONTACT A REPRESENTATIVE

WWW.WORKSTATIONSPECIALISTS.COM

+44 (0) 800 180 4801

SALES@WKSMAIL.COM

Workstation Specialists

© 2015 Workstation Specialists – Acecad Software Ltd. E & OE. © 2015 Intel Corporation. Intel and Intel Core are trademarks of the Intel Corporation in the U.S. and/or other countries. Logo & company/ product names are trademarks of their respective owners

CODE TO JOY: THE MAKING OF PIXAR'S INSIDE OUT

James Clarke talks to the Pixar team leading the creative adventure that brings life inside the mind to the big screen

It was immediately obvious to producer Jonas Rivera, in 2009, that the concept that Pete Docter pitched to him for what would become *Inside Out* was "a really good idea. But how in the world are we going to make it a movie?"

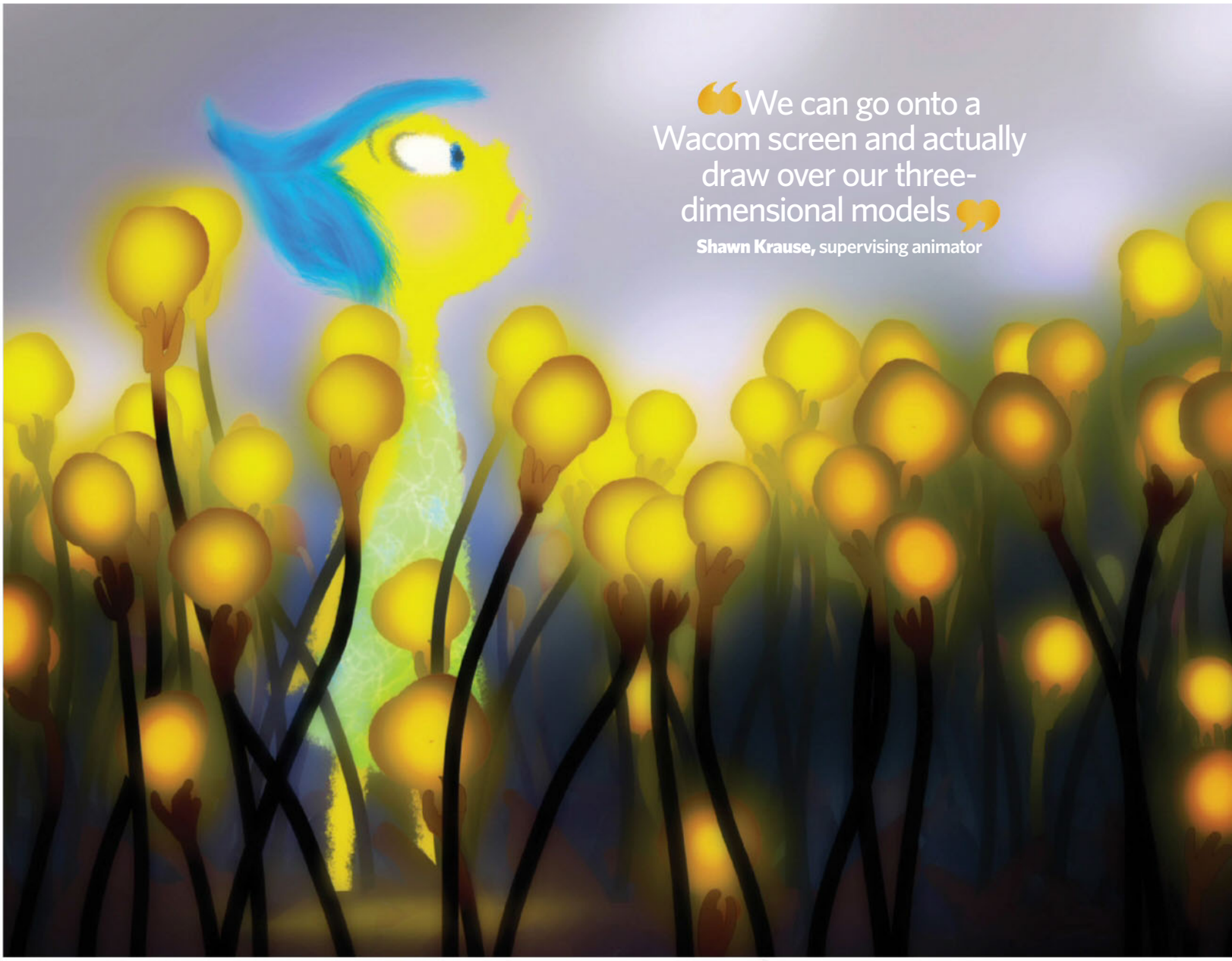
Animation can excel at expressing the truth of something through caricature and a fresh visual spin on a familiar subject. This combination of invention and emotion characterises *Inside Out,* the new Pixar film that imagines the relationship between a girl named Riley and her very lively emotions. The movie has recently enjoyed success at its Cannes Film Festival premiere and *Inside Out* looks set to become one of the most significant creative achievements for Pixar in its nearly 30-year history.

Co-directed by Pete Docter and Ronnie del Carmen, the film reunited core collaborators from *Up.* Docter's films at Pixar have proven especially rewarding in their visual invention and dynamic narrative structure, snapping together with stunning storytelling precision. In *Monsters, Inc* and *Up,* setting, characters and situations are marked by a nicely metaphorical appeal and *Inside Out* maxes out this hugely successful creative approach.

In speaking with several of the film's creative leads, what's repeatedly acknowledged was the need for the team to regularly pose itself fundamental questions throughout its process, from the earliest concept through to rendering the finest details of a character's performance. Production on the movie involved a core animation team of up to 45 animators, rather than the typical 80-90. This presented its share of challenges and opportunities too, prompting the team to lead the charge of designers, animators and technicians.

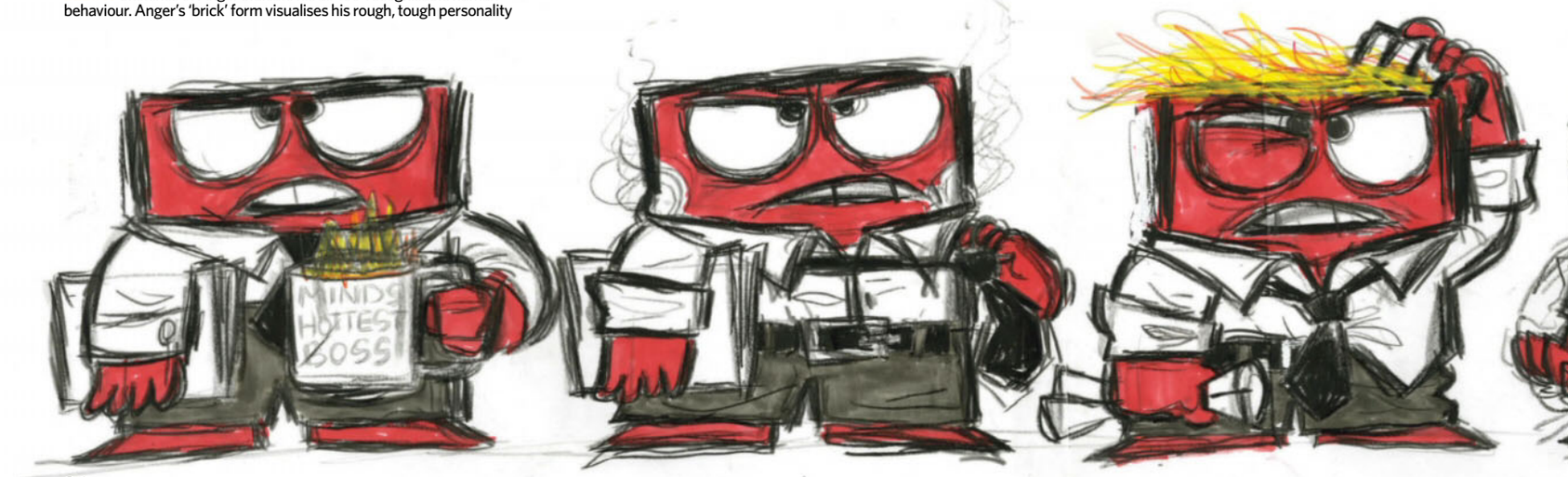
Core to the production's initial work was determining how to show the abstractions of mind and emotion. Josh Cooley, story supervisor on the movie, sets the scene: "It's not like *Cars*, for example: you know what a car looks like. There's stuff that's tangible. With emotions, memories and the mind it's so abstract that we were creating a world at the same time as we're creating a story. It was the hardest story I've ever worked on. We were just trying to capture the feeling of an emotion in a visual form which was really difficult."

All images © Disney Pixar



ABOVE Throughout production on Pixar's movies, the team reviews the storytelling by refining character designs and performances

BELOW Sketches of Anger indicate his all-too-recognisable human behaviour. Anger's 'brick' form visualises his rough, tough personality



Character building

In beginning to find a form for the world of *Inside Out*, co-director Ronnie del Carmen and his team had to answer fundamental real-life questions in order to enrich the fantasy of the movie. Ronnie notes that "childhood is about being happy. It's about laughing and playing so it made sense that the lead emotion would have to be Joy. From then on we started building all the other characters: Sadness, Anger, Fear and Disgust."

Pixar's movies crystallise the inseparable relationship between technology and creativity, and for Shawn Krause, supervising animator, the production offered his team the opportunity to push its modus operandi in its alliance of hardware, software and the human creative impulse: "For me, it's always been the wonderful thing about the computer. It has the feel of a stop motion film when you're moving a puppet around but you're not limited by the actual, physical model. You can push and pull it like you would a drawing. There is some of the most subtle human expressive animation and some of the broadest most pushed animation we've ever done here."

Shawn then goes on to discuss a particular working process the team developed for *Inside Out*'s production. "I think the biggest thing on this show is that we've been slowly developing a tool that we actually could use to its extreme – we can go onto a Wacom screen and actually draw over our three-dimensional models. It was a way to really break away from the limitations, or at least the limitations you put on yourself, and the technical challenges when you're using a computer versus the free-form thinking of drawing.

"We had a new role on this film, taking a cue from what Glen Keane did on *Tangled*. Tony Fucile, who's a veteran and a great animator having worked on *The Lion King* and other films, would come in and do sketches and drawings over our work to 'plus' it; to make us think outside of the model. A lot of times we would pose something and it'd look nice and then he'd draw over it and go 'well, if I was drawing it I might do it this way, because it's a little stronger'. So, we were really trying to think graphically."

Creating character behaviour rooted in dramatic conflict and the pursuit of a goal, Ronnie del Carmen explains that "the one thing we discovered was that if we made Joy happy all the time she's annoying or Anger if his [only] response is to be angry; we were very concerned about that. We understand that Joy wants to make Riley happy all the time but all the other characters don't want Riley to be angry all the time, they don't want Riley to be fearful all the time. Joy wants to make sure they have a happy kid. Joy doesn't quite know what sadness is about. In character design, most of the time the concern is to make sure that you can recognise that this is the character it needs to be. It's mostly about trying to feel the character, trying to find out if the character is appealing or that it feels and looks like the character before you even get to the technical challenges of making sure those particles are able to behave. We wanted to make sure that we owned what an emotion looks and feels like. So that was a very big challenge."

Certainly, the emotion characters of *Inside Out* are some of the most distinct that Pixar has yet designed and of the rigorous character design work developing the emotions, Shawn Krause adds that, "for us, in the beginning, it was like 'what do they do all day?' We were as involved as they were, we were

Lighting up the mind

STEVE MAY, CTO OF PIXAR

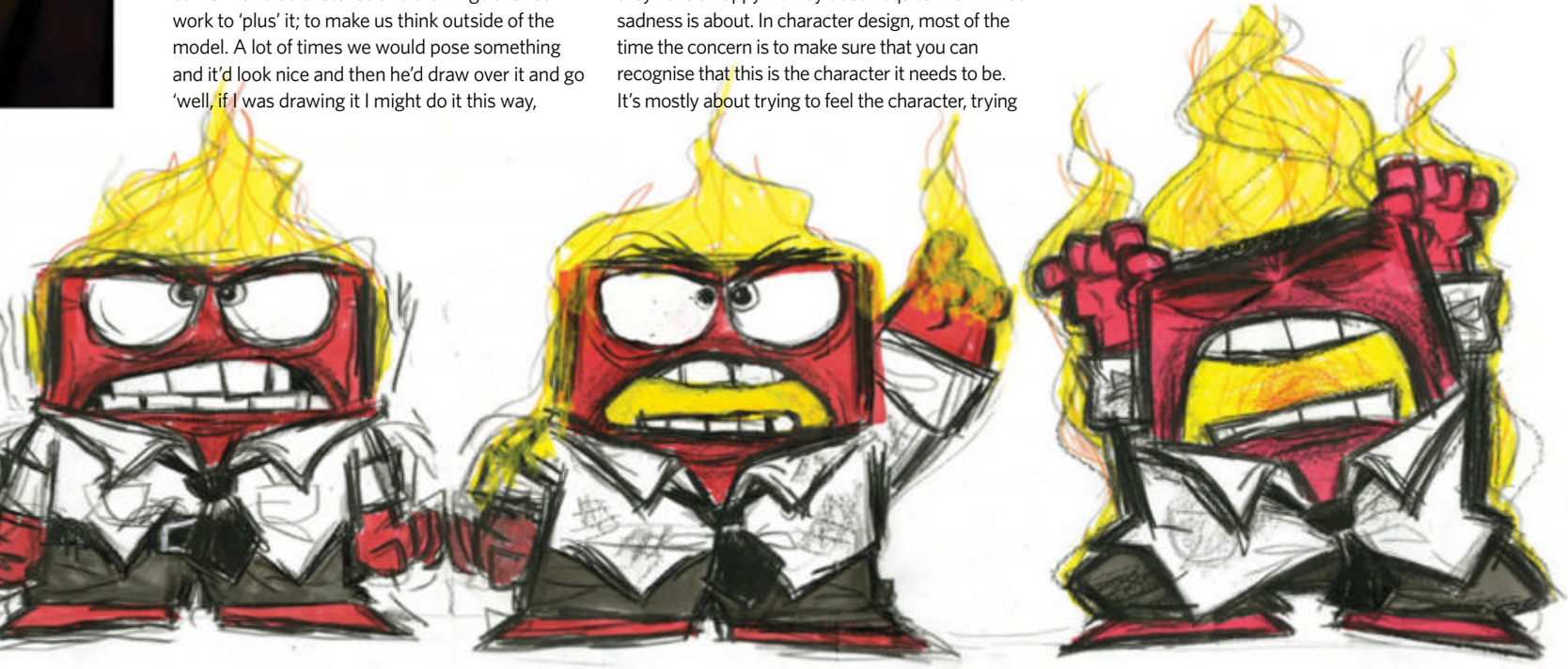
"Each [emotion is] emitting light and their body is made up of these semitranslucent particles and volumes. You have nothing like that in the real world! The challenge was actually getting that look for those characters and to have the audience have this feeling that they really haven't seen this thing before and that was one of the big challenges. How do you direct the eye and do the things we want to do artistically when we've got some of the characters glowing and emitting light? How do you separate them from the background and how do you cast them on the set? So there were a lot of artistic challenges in that, and how do you use the physically based renderer to do those things that aren't so physically-based looking?"

JOSH COOLEY, STORY SUPERVISOR

"If you look closely you'll actually see that the characters are made up of effects. They don't have a clear line as to where their skin begins and ends. It's kind of particles moving within their form. So when Anger gets really angry you can see those particles moving around like crazy. When Joy gets really happy they really bounce around. They do have a chemical feel. When they really start to feel their emotion they get very vibrant and active."

JONAS RIVERA, PRODUCER

"On *Monsters University* the tools group developed Global Illumination which really helps the lighting process. It's faster rendering and it computes real shadows. It gets you a lot closer faster than we've ever gone in the past. Now of course in a movie where the character is a light source we've sort of turned that on its head a bit. But still, it helped us get visually where we were a lot faster than I think if we had made this movie ten years ago. I don't know if some of the visuals would even have been possible back then [for *Inside Out*]."



really figuring out the film [and] they were just trying to figure out what's the story on the outside world, what's the story on the inside world? As we got into it we started leaning towards a more pushed, broad cartoon-y style of animation. One reason might have been that Pete was saying he always pictured Joy as having a little bit of rascal in her, kind of like Bugs Bunny, like a practical joker. We started leaning that way. Joy was probably the most difficult. Pete always saw her as grounded. Initial tests that I'd done had a light buoyance, almost ballet-like, and he said 'no, I want her to be stomping around and more athletic'."

In developing Joy, the production grappled with determining a vital detail that's typically essential to defining the essence of an animated character. Shawn Krause recalls: "Probably the biggest challenge, for me at least, was Joy's eyes. Most characters have round eyes. [We have] a character who has very stylised, tall, big eyes, I mean eyes as big as the head almost. We were struggling: how do you get subtlety out of that? How can you do a barely closed lid on the top and not have it start [until the] iris and get to be mushy looking? We wanted the freedom to have extreme control over the upper and lower lids on such a broad character."

Building on the design and animation of the eyes for Woody in the *Toy Story* movies, Shawn notes: "The character team really developed a new eye-rig that combined the lids. The upper and lower lids are just shutters basically. They're hooked straight across and they go up and down as opposed to a human eye which is all connected at its corners, and is very fleshy and organic. Our character team came up with a hybrid version of that based on drawings we'd given them. On top of that, for Joy's eyelashes – and the thickness of her upper-lid shape – we wanted a calligraphic, pen-like quality to it and to do that the animators had to go in and make the eyeliner thicker or thinner, bias it left and right, and make it sharper or less sharp depending on what they wanted to get out of that expressive eye shape. I think the theme of our film was always to capture a bit of the feel of a hand-drawn feature."

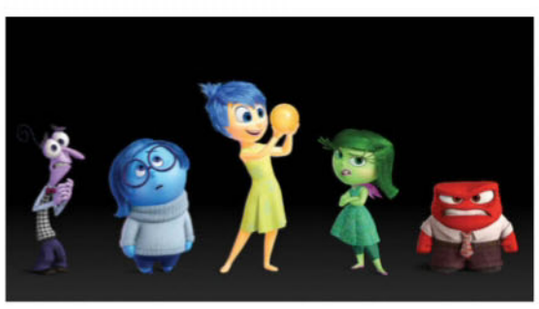
With its focus on those little voices inside our head, *Inside Out* offers something of a 21st Century riff on the relationship between Jiminy Cricket and Pinocchio in the classic Disney movie. Ronnie del Carmen puts it nicely when he tells us that "emotions, we learned through talking with researchers and scientists, are there to help prepare you to face the world."

Throughout the project, keeping the distinctions clear between action happening inside and outside the mind was a balancing act, as Josh Cooley recalls: "One of the things we wanted to make sure of right from the beginning was that we didn't want Riley to feel like a robot, like the emotions are telling her what to say and what to do. We didn't want her to seem like a big robot walking around with these little characters controlling her. It was a delicate balance. At times it felt like she was a robot and at times it felt like they had no control over what she did. So, that took time to find that line."

In terms of storyboards, sketches and renders indicate character performance and lighting possibilities. Characters interact dynamically with their environment before being fully rendered for light, shade and texture

“[Joy has] very stylised, tall, big eyes, I mean eyes as big as the head almost. We were struggling: how do you get subtlety out of that?”

Shawn Krause, supervising animator



How the Pixar team produced the film

SHAWN KRAUSE ON THE EMOTIONAL POWER OF INSIDE OUT AND PIXAR

"If someone tries to capture the energy of a moment or caricature an expression, I think that *that* sincerity's going to come through. That sincerity's going to make people watch your work."

JONAS RIVERA ON CHARACTER DESIGN PHILOSOPHY

"When you think about the mind you think about synapses and energy, like electricity. So that really stuck: what if everything was made out of energy? So it's not like material or skin or clothing but it's like this compressed energy and light, and so Joy became this character that was literally made out of light.

"Our team, led by Michael Fong in technical, had a ton of work to try and chase these very abstract concepts down and make them literal and functioning so that we could actually produce shots. Joy's in 1,500 shots in the movie. So now you've got all your lighters, 60 people on the team, who know how to light shots. Well, now they have something they've never done before."

SHAWN KRAUSE ON THE TEAM WORKING TOGETHER

"We really wanted to make a point of a smaller crew. We get to know and talk to our crew a little more frequently and intimately. And for the crew they get more ownership, they get to do more shots on the film. They get to, you know, keep doing the same character."

SHAWN KRAUSE ON KIT

"We had a new way of looking at what we call PIPS: Pictures In Pictures. With our new operating system, we can actually have several shots up at the same time and it will show live what we've done in the other shot while it's open. So, if we see something we don't like, or it's popping or syncing funny with our outside shot – say the control room, whatever's on the screen – we can go to that other screen shot, change it and when we come back to the mind-world shot again it will have updated live. So that was a really convenient thing because there were so many shots that had, basically, television screens in them."

> "We had to create this vast landscape outside of headquarters where they can house all of Riley's memories"
>
> **Ronnie del Carmen,** co-director

Architecture of the mind

Simultaneous with locking in designs for the emotions, the production began developing the look and shape of the world of Riley's mind. Of this world-building process, producer Jonas Rivera recalls: "Pete said, very early on, that 'this movie should be [about] the mind and not the brain'. In other words, it should be metaphorical. It should be implied and artistic. That's very cool, but what does that look like? What's the visual hook? When you're trying to personify an emotion or explain visually what inside the mind looks like, or what memories look like, there's nothing to look at so there was this tremendous amount of visual development just to find something that looked fun and cool and gettable so the audience would know 'oh yeah, that's what a memory looks like'."

Of the evolving look of the film, the terrain of the mind had to be whimsical and far from cold and clinical. "We had to create this vast landscape outside of headquarters where they can house all of Riley's memories and that was amazing to see," Ronnie del Carmen explains. "We had to create the largest sets that Pixar has ever made because it must be so vast so that all of those memories can be funnelled down there to that landscape all the way to the horizon."

Cinematic mindset

Pixar's films have often been lauded for their cinematography and of *Inside Out*'s visual style Ronnie del Carmen explains: "Patrick Lin, our cinematographer and head of layout, had come up with a great cinematic language that starts to approach the complexity of telling the story that not only represents characters inside a main character's mind but you also have to be telling two sets of stories throughout the movie. And then, Riley would have her parents to relate to and there would be two places, two states to mind. So, all of those things would have to somehow be represented.

"So, we wanted to make sure that the camera work that's done for inside the mind is different from the camera work that's done outside the mind and not to do it so that it's blatantly obvious. It should be so subterranean that when you watch the movie you won't pay attention to it but somehow, underneath it, you know that you have been calibrated to experience the mind differently with the use of the camera and the outside world in different ways with the use of the camera: that goes for staging, lighting, colour choices, palette – all of those things that (production designer) Ralph Eggleston had to work with. When the emotions do their job, inside headquarters, inside the mind, we then cut to outside and see how that affects the world. We don't want confusion. We want it to be pleasant, entertaining."

Inside Out is in cinemas from 17 June (24 July in the UK). For more info, head to movies.disney.com/inside-out. Our thanks to Disney and Pixar for their help with this feature.

These sketches emphasise an appealing cartoon aesthetic for Joy, capturing her physical and emotional energy

/pcspecialist @pcspecialist

pcspecialist

Award winning custom PC & Laptop manufacturer

Wireframe 750

- Intel® Xeon® Quad Core E3-1271V3
- ASUS® Z97-WS
- 32GB HyperX FURY RAM
- PNY NVIDIA Quadro K4200
- 240GB HyperX 3K SSD
- 2TB WD Caviar Black
- H80i Corsair Hydro Cooler
- 3 Years Warranty

THIS SPEC FROM **£1,799**

Quality builds at a low price
Always

GET A FURTHER £15 OFF WITH THIS EXCLUSIVE VOUCHER CODE:

WRK15

ORDER ONLINE NOW

0333 011 7000
www.pcspecialist.co.uk

Featuring 4th Generation Intel® Core™ Processors

Intel, the Intel logo, Xeon and Xeon inside are trademarks of Intel Corporation in the U.S. and/or other countries.

intel inside CORE i7 intel inside XEON

Technique focus

Incredible 3D artists take us behind their artwork

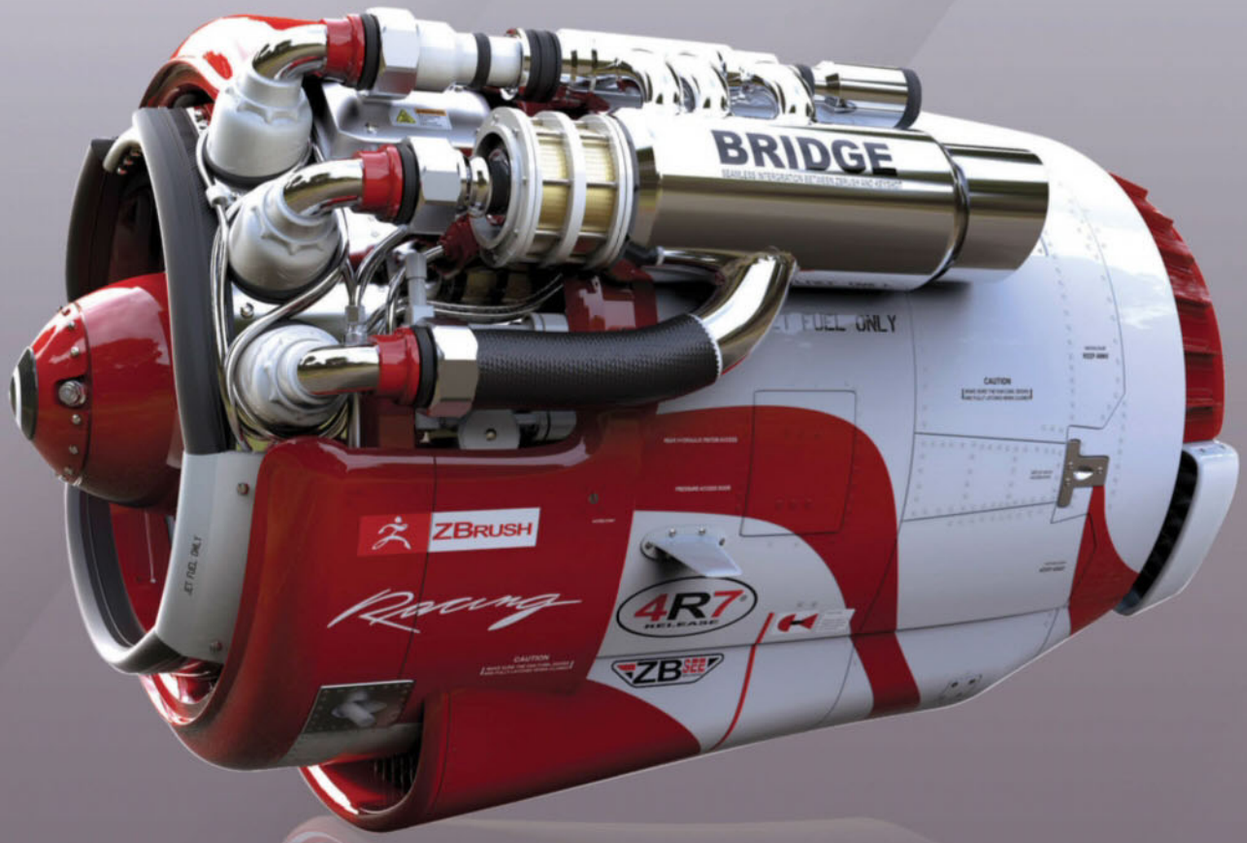
FEAR "For a long time we had Fear as like an antagonist to Joy," remembers story supervisor Josh Cooley. "One day Pete [the director] came in and said 'You know... I think that the correct way to tell this story is to have Joy not understand sadness and that's what she's coming to learn about. That was a big shift and it turned to out to be the right one."

ZBRUSH 4R7®

NOW AVAILABLE

AN ALL-IN-ONE DIGITAL SCULPTING SOLUTION

DESIGNED FOR THE PURSUIT OF ART



NOW AVAILABLE

Available for Windows and Mac · www.pixologic.com

TO RENDERMAN 20 AND BEYOND

We take a look at the past, present and future of the world's most famous rendering engine, and how it continues to revolutionise the industry

Many of us only know of it as Pixar's in-house renderer of choice: a final tool in bringing the worlds of *WALL-E*, *Finding Nemo*, *Up* and *Monsters University* to life for the big screen.

But there is so much more that makes RenderMan such a remarkable piece of software. Now at 27 years old, its origins are closely linked to not just those of Pixar, but the whole CG industry. It all started at the University of Utah during the Seventies where Ed Catmull, who would later become a founder of Pixar, did his PHD work on rendering problems as a student of Ivan Sutherland.

By 1979, Catmull had garnered the attention of George Lucas with his work. He recruited Catmull to head Lucasfilm's Computer Division in California, at a building right next door to ILM.

The division included co-inventor of Photoshop John Knoll as well as John Lasseter, Loren Carpenter, Tom Duff, Rob Cook and, even briefly, Jim Blinn. Together, they had the goal of creating complex, photorealistic imagery that was virtually indistinguishable from filmed live action with a dream of making a whole film using nothing but CG. At the time, it all seemed utterly unimaginable, but one thing was for certain: they needed to create a renderer to stand a chance of achieving anything at all. The result was a rendering algorithm called REYES, or affectionately 'Renders Everything You Ever Saw' to the team.

Seven years later, the Computer Division was bought by Steve Jobs and spun off into a brand new independent company – Pixar. One year later, Cook, Carpenter and Catmull presented a paper called 'The Reyes Rendering Architecture' at the 1987 SIGGRAPH conference. It was the first foundation of RenderMan as we know it today, and most importantly, enabled the original Computer Division team to achieve its final goal. With *Toy Story*, the once impossible dream of creating a whole film entirely on computers would become a reality, and RenderMan was utterly crucial in enabling it all to happen.

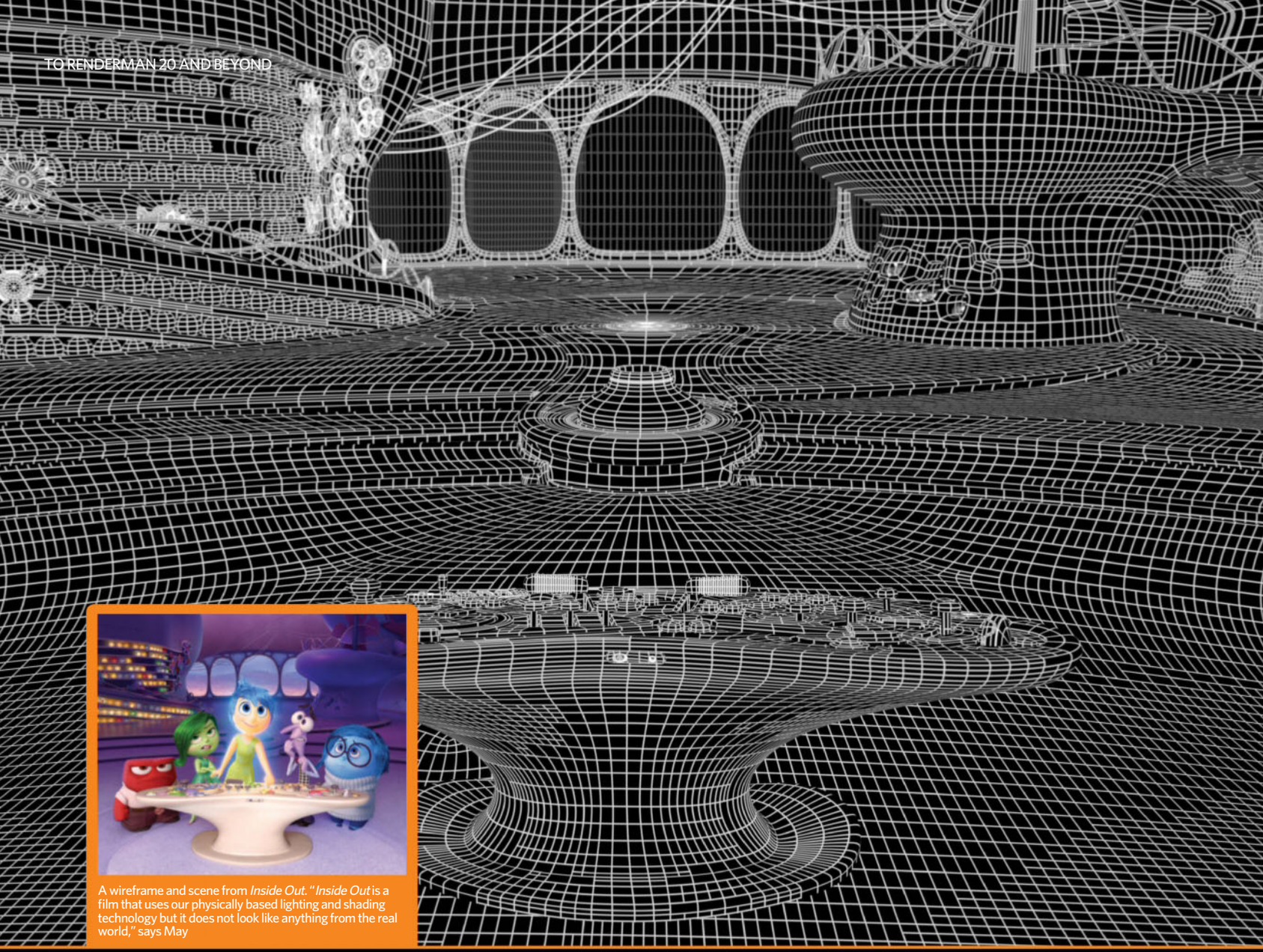
Contributors

Steve May
Chief technology officer at Pixar

Christophe Hery
Shader developer and TD at Pixar

Per Christensen
RenderMan developer

Julian Fong
RenderMan developer



A wireframe and scene from *Inside Out*. "*Inside Out* is a film that uses our physically based lighting and shading technology but it does not look like anything from the real world," says May

Dealing with volumes

For RenderMan 20 the team has also done a lot of work to make sure that dealing with volumes and motion-blurred volumes is something that RIS can do better than REYES. The timing is no coincidence: *Finding Dory* is going to be rendered fully using RIS, and it's not just for the underwater scenes that volumes will be needed. "Pretty much everything is a volume in that movie, there's volumetric scatter even on the characters," says Julian Fong. "For 20 there's been some improvement. Out of the gate for 19 there were a few missing features like support for overlapped volumes which is actually fairly hard in a path tracer, but that's been added for 20.

"RenderMan 20 also adds some improved sampling techniques, one of which is called equi-angular sampling. That improves convergence for particular kinds of lights inside volumes, and there will be more improvement on this for the future."

A NEW EVOLUTION

Fast-forward to today, and RenderMan has been routinely used not just by Pixar but a host of other visual effects studios around the world for movies like *Mad Max: Fury Road*, *Interstellar*, *Lord Of The Rings* and *Star Wars*. How it's thrived for so long has been no big secret. RenderMan is in continual evolution as a production renderer, and now its team is shaking up the entire industry once again with RenderMan 20, the Non-Commercial RenderMan and RIS.

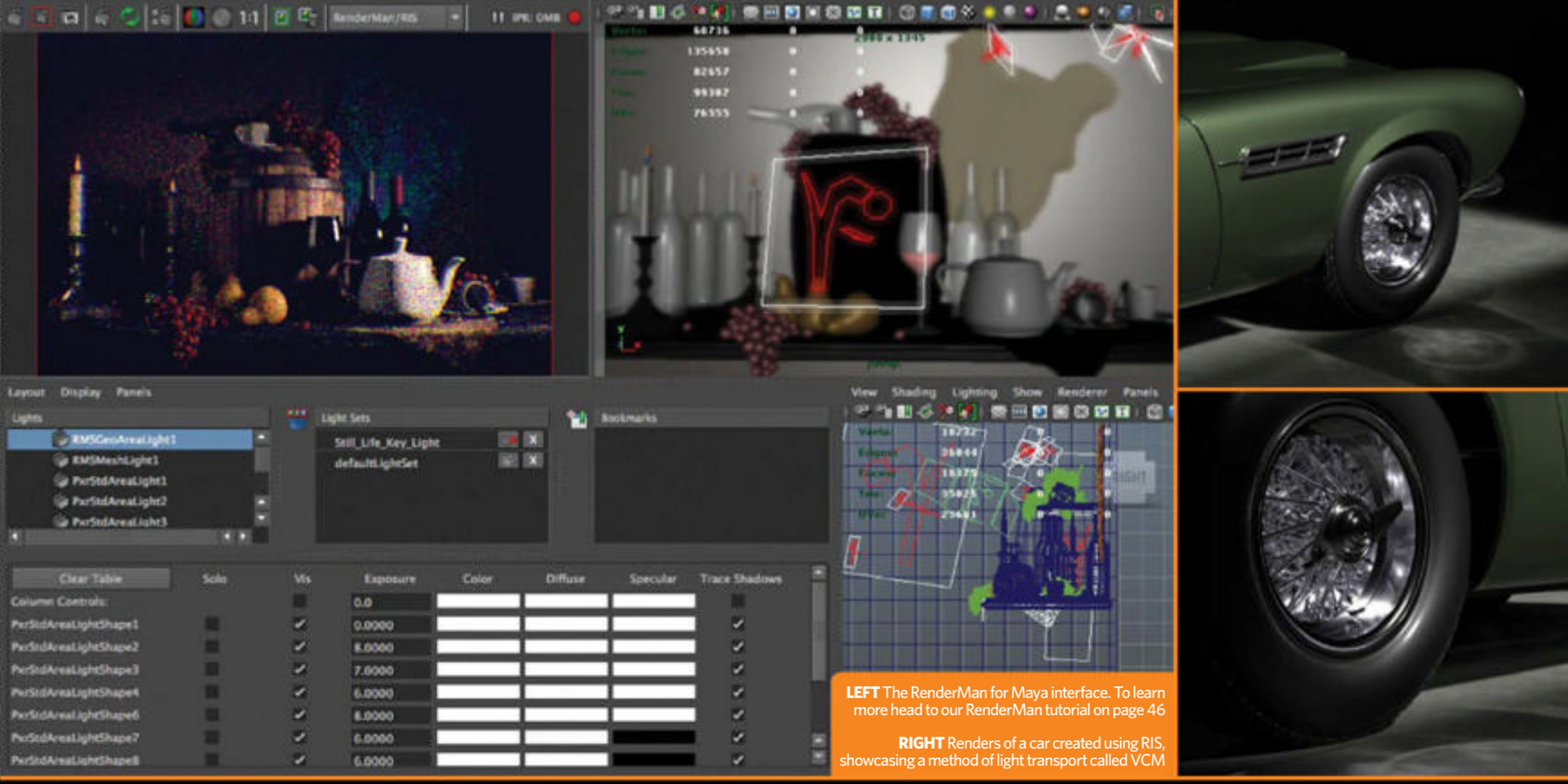
"When I was a student studying computer graphics I read about all the tech papers, and so many of the things that were invented at the time were by people that were at Pixar," begins chief technology officer at Pixar Animation Studios, Steve May. "People ask if I meet celebrities with this job that I'm excited about, and I say well really the celebrities I know are still at work! One of my first bosses here was actually Tom Porter. He invented compositing and stochastic sampling, which is what we use in all the modern path tracers now to do motion blur and depth of field!"

For May, RenderMan is a pretty unique part of Pixar's history. He reminds us that a lot of Pixar's software and techniques have actually been kept proprietary, like its animation system, so RenderMan is one of the very few examples of something that from very early on was made available to people outside of Pixar.

It makes the recent announcement of Non-Commercial RenderMan, which is completely free for anyone to use for non-commercial projects, sound like even more of a game-changer. After all, it's made rendering technology, which used to cost thousands of dollars per licence, completely free, bringing rendering innovations from Disney and Pixar production straight down to anyone who wants to try them.

"We're really trying to remove barriers and obstacles that people would have to use RenderMan," May continues. "We kind of had this discussion last year where we looked at various different scenarios like 'do we make it really cheap or maybe it has no watermark or something', and we're looking at each other and finally say, 'maybe let's go the whole way and make it completely free and have no restrictions on it whatsoever other than you can't use it in commercial movies and things.' We're really excited about that."

Pixar is now even starting to open RenderMan's code up to others – providing source code for many



LEFT The RenderMan for Maya interface. To learn more head to our RenderMan tutorial on page 46

RIGHT Renders of a car created using RIS, showcasing a method of light transport called VCM

of its plugins and integrators like the unidirectional path tracing integrator; all of this has been done to encourage the renderer to become a platform for experimental research and for more external integrators to be developed.

At the exact same time, the RenderMan team has also come out with RIS, a brand new rendering paradigm that could soon replace REYES for good.

RIS

The need to create an alternative to REYES actually came hand in hand with the emphasis on more physically based rendering, a major shift in the industry that has made artists' lives much easier than ever before.

"I would kind of claim that up until 2005 the effects industry and the animation industry were using ray tracing, but we were not using Monte Carlo or any kind of physically based model," reveals Pixar shader developer and TD Christophe Hery. Without a physically based model, every render produced would actually be physically inaccurate, displaying lighting that would never truly occur in real life. Artists would then need to rely on all kinds of tricks and hacks just to be able to create realistic final renders.

"Basically the best way of computing pictures that look realistic is to just do a simulation of how light is scattered in real life and we can do that now," confirms RenderMan developer Per Christensen, who has been working at Pixar for 14 years. "Back in the day if you wanted to make something that looked like it had indirect illumination – so bounce lights from surfaces onto other surfaces – there was no way that you could. It would be too expensive, so what you would do instead is place all these extra light sources in the scene to fill in the shadows. It was a very tedious, cumbersome workflow."

Even at Pixar, elements like bounce cards were used to cheat true global illumination as recently as films like *Toy Story 2*. Even during production of *Monsters University*, the same types of practices pushed the lighting director to take a stand. "Up until then they had a workflow that was kind of old style, though there was some amount of illumination," Christensen continues. "Basically the lighting director said this is really getting out of control, here's a scene from a previous movie, and here are all the lights that are in that. And there was just screen after screen of lights! TDs would put in lights [with their thought process like] 'okay this light only illuminates Woody or this light only illuminates this floorboard' and stuff like that, so it would just be pages and pages of light sources, some of which only illuminated part of the scene."

The decision was ultimately made that enough was enough – that artists should be able to just rely on global illumination to do all that work. Now, Pixar films typically only have 12 to 20 light sources in a whole scene compared to the hundreds of sources that had previously dominated.

"RIS was designed to scale to these gigantic shots where global illumination is required absolutely from the get go without having to set up these complicated multipass shots," explains RenderMan developer Julian Fong, who has been working at Pixar since 1999.

As a major advance RIS, or RenderMan Integrator System, is a highly optimised new rendering mode created for global illumination that artists are now able to rely on. More specifically, it works wonders for ray tracing production-level scenes with heavy geometry, hair and volumes with both world-class efficiency and all in a single pass.

Designed to be easy to use, RIS enables users to choose the most appropriate method of light transport for any given scene, including path tracing and VCM – a method of light transport which integrates bidirectional path tracing together with photon techniques. By combining the two methods, VCM can produce better rendered results for tricky shots like indoor scenes compared to either method on its own.

All of this is essentially turning RenderMan 20 into a brand-new renderer, and it's now also changing the way that people think when they are creating their scenes. "People are now starting to use cheats to light their characters which are actually inspired by real-life cheats," says Fong. "You can actually think about problems in a way that's inspired by how people work with actors on set, and carry the solutions over to CG now that you're actually doing everything physically based. So the lines are kind of blurring."

The Marschner hair model

For many years, in fact, the standard hair reflection model was the extension of the Phong model proposed by Kajiya and Kay in 1989. Then over a decade later, in 2003, Marschner proposed a new comprehensive physically based light scattering model from human hair fibres, which became the basis of Hery's work at Pixar. Hair rendering is computationally expensive, and Hery had to learn everything from the biology of hair to how different hair types will deal with light internally as well as how they reflect light to be able to create a new implementation of the Marschner hair model.

27 Years of Pixar's RenderMan

PIXAR's RenderMan®

knick knack

THE COMMERCIAL YEARS

From 1990 to 1996 Pixar created many innovative 3D commercials for television, while developing its rendering technology — Photorealistic RenderMan.

1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994

RI SPEC 3.0 PUBLISHED

With the first use of the word "RenderMan", the RenderMan Interface Specification was the culmination of years of Pixar's rendering development and set the standard for describing 3D data.

PIXAR'S RENDERMAN 3.0

- Stochastic Sampling
- REYES Algorithm
- Micropolygons

PIXAR'S RENDERMAN 3.1

- RIB (RenderMan Interface Bytestream)
- Constructive Solid Geometry
- Vector RenderMan

PIXAR'S RENDERMAN 3.2

- Pixar "Looks" Support
- Z Threshold Shadow Opacity
- Better Memory Utilisation

PIXAR'S RENDERMAN 3.3

- The Netrender System

ACHEIVEMENT AWARD

Scientific and Engineering Achievement Award from the Academy of Motion Picture Arts and Sciences.

PIXAR'S RENDERMAN 3.4

- Trim Curves
- Extreme Displacement
- Vertex Motion Blur

PIXAR'S RENDERMAN 3.5

- 64-Bit Processor Support
- Filterstep

"The original motivation to do the research that led to these technological discoveries was to expand the range of possibilities for storytellers"

ED CATMULL

President of Walt Disney and Pixar Animation Studios

PIXAR'S RENDERMAN 11.5

- Scene Analysis Acceleration
- Hider Subpixel Output
- Deep Shadow API

PIXAR'S RENDERMAN 12

- 3D Brick Maps
- OpenEXR Support
- Ri Filters

Boundin'

One Man Band

Cars

WALL·E

2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009

PIXAR'S RENDERMAN 12.5

- Accelerated Ray Tracing
- Hierarchical Subdivisions
- Point Cloud API

PIXAR'S RENDERMAN 13.0

- Multithreaded Rendering
- Brick Maps as Geometry
- Point-Based Colourbleeding

LIFTED

PRESTO

PARTLY CLOUDY

Disney · PIXAR RATATOUILLE

PIXAR'S RENDERMAN 14.0

- Rerendering Technology
- PRMan SDK
- PRMan for Python
- Brick Map API
- Organised Point Clouds
- Accelerated Ray Tracing

UP

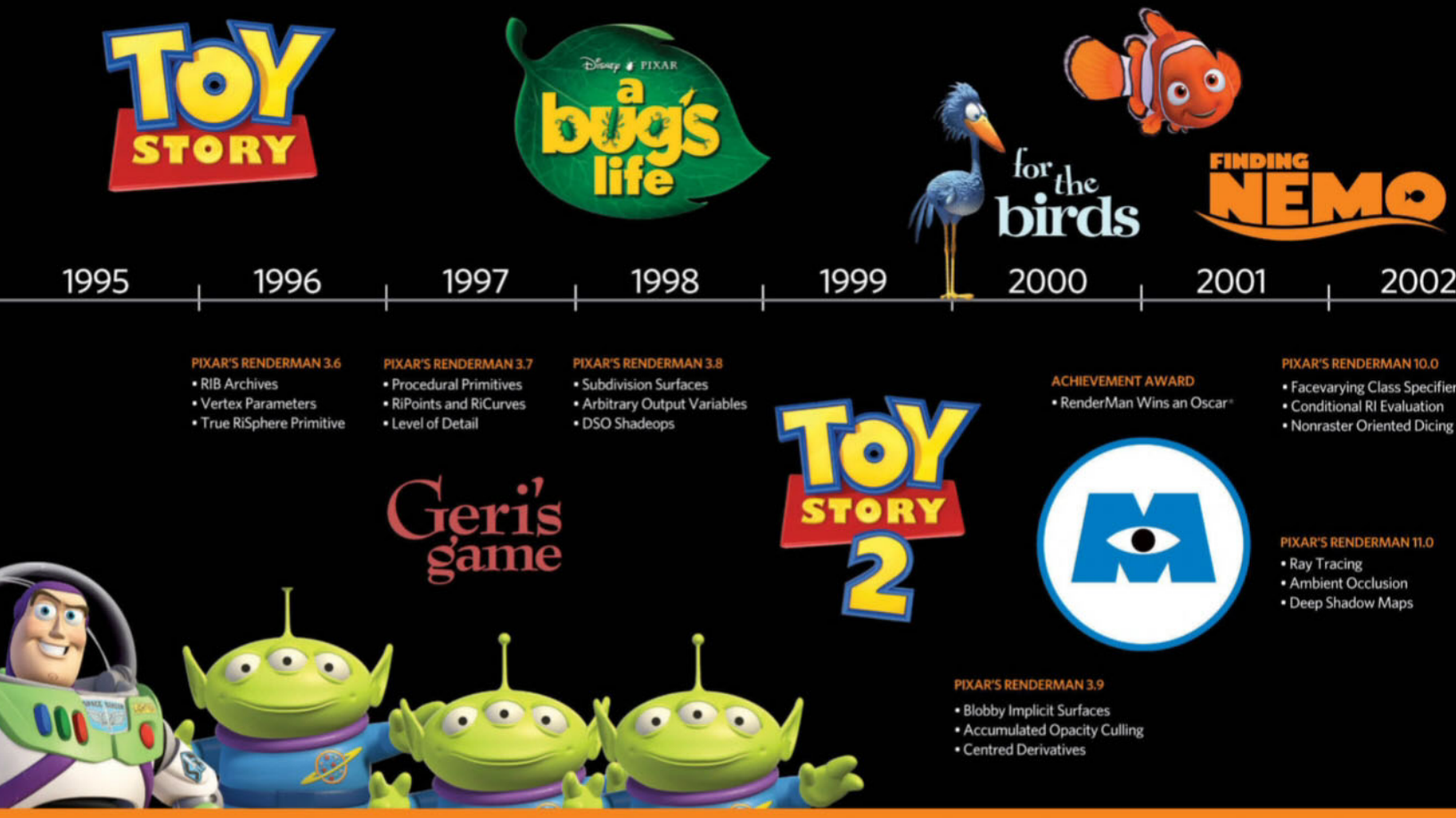
PIXAR'S RENDERMAN 13.5

- Stereo Multicamera Rendering
- Shader Objects and Co-Shaders
- Multithreaded Netrender and Ptfilter

PIXAR'S RENDERMAN 15.0

- Volume Primitives
- Imager Shaders
- Support for Disney's PTex
- RSL Enhancements
- Unlimited Threading

© Disney/Pixar 2015



ACHIEVEMENT AWARD

Scientific and Engineering Achievement Award from the Academy of Motion Picture Arts and Sciences.

PIXAR'S RENDERMAN 16.0

- Ray-Tracing Hider
- Progressive Rerendering
- Physically Plausible Shaders
- Deep Compositing
- Traced Deep Shadows

MU

PIXAR'S RENDERMAN 19.0

- RIS Technology
- Unidirectional Path Tracer
- VCM (Bidirectional Path Tracer)
- Adaptive Sampling
- C++ BXDFs

PIXAR'S RENDERMAN 20.0

- Denoiser
- Light Localisation
- Marschner Hair
- Physical Camera
- HoldOut Shader

SANJAY'S SUPER TEAM

Day & Night

THE GOOD DINOSAUR

RENDERMAN®

NEW FEATURES

It all sounds too good to be true, particularly when you consider the new progressive renderer functionality in RIS, which provides some insanely fast iteration throughout production. With it, artists can see a full frame render of their lit, textured scene including hair, volumes, motion blur and bokeh in a matter of seconds.

There are, however, still some negatives to RIS when compared to REYES that means that, for now, RenderMan needs to employ a hybrid architecture so that users can have the best of both worlds. "The biggest negative compared to REYES is actually the noise," Fong explains. "The lighters here at Pixar are very well tuned to seeing noise in renders. So while they really appreciate the fact that they can get much quicker turnaround, basically there's the trade off – you have to wait for the noise to go away."

Enter one of the huge new features scheduled for RenderMan 20: the Denoiser. An adopted technology, the Denoiser actually comes from the gurus at Disney Feature Animation, who were developing it for use with their own in-house renderer, Hyperion, to solve the problem of noise whilst working on *Big Hero 6*. It's impressive proof of the power the RenderMan team now has as it can employ ideas from not just within Pixar, but Disney Animation and Disney Research, collaborating with labs around the world. It's a testament to the bright future awaiting rendering.

"The Denoiser kind of cuts the waiting off and says 'Okay, stop once we have an image that might not be fully rendered out but has a reasonably low level of noise,'" says Christensen. "Then you just run this Denoiser program on it and get rid of the noise, removing it to a level where it is acceptable as a final quality render."

There are just a few things you need to do to make it work. "You have to write out multiple separate images – the diffuse colour in one channel, and the specular colour in another channel," Christensen continues. "You also need to write out the depth and surface orientation in each pixel, and some motion vectors. Then this Denoising program can work its magic and do some really well-informed noise reduction, and the key insight there is oftentimes maybe you'll have a lot of noise in the specular channel but not a lot in the diffuse or the other way around, so it'll know 'okay, this channel needs a lot of blurring but this other one doesn't'. It's not like in Photoshop where there's a filter that just blurs your picture to get rid of the noise and simply just blurs everything. This Denoiser program is much more intelligent than that."

When dealing with a whole batch render, the Denoiser can actually take advantage of every image in a sequence, looking at information from the previous and next image to improve its noise filtering on the current one its working on.

"Another upcoming feature I want to mention is light localisation," tells Christensen. "It's kind of a weird term, but the thing is if you have a scene with thousands of light sources, just computing the direct illumination at each takes a lot of effort, but there are ways in which we can reduce that computational effort by trying to be a bit more clever about which light sources we can disregard." By looking at elements like which light source is the biggest and brightest, how far away it is and whether something is blocking it or not, light localisation can work to make sure unimportant lights are disregarded so that the render won't generate that much noise to begin with.

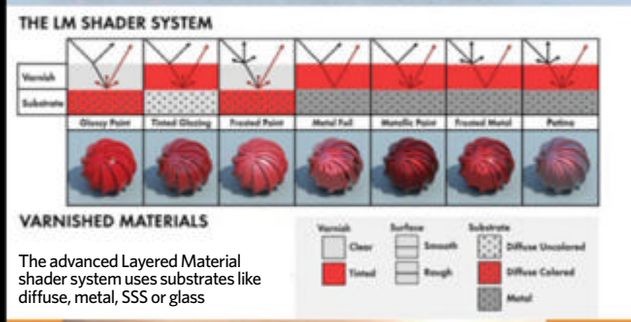
Hair is also something we can expect to see looking more rich and realistic than ever before with RenderMan's brand new implementation of the Marschner hair model, which has now been successfully used on *The Good Dinosaur* as well as *Finding Dory*. It was Christophe Hery's job to come up with a shading model to use, initially for work on *Monsters University* before shifting over to RIS.

"You want round tubes that each hair represents and in the past they were sort of flat surfaces, almost like Venetian blinds," remembers Hery. "This full model that we have now is just amazing, kind of magical – and we did some comparisons to other models, like you know from Weta and other companies, and we produced roughly the same images that they did but we simulate more stuff than they do. We account for eccentricity on the hair, the fact that the hair is not really a cylinder, its cross-section is actually an elipse not a circle. It's really amazing if you change that eccentricity – it goes from looking like a plush toy to real hair, and we account for caustics in the hair and things like that as well. I think it's a really good practical solution with a lot of really nice artistic features and I hope you'll see that on *The Good Dinosaur*."

THE NEXT 25 YEARS

With future features like Unified Points, Beams and Paths for more efficient light transport, RenderMan certainly seems set for the next 25 years.

"We really want to have RenderMan be able to be the renderer that can do anything without compromises," says Julian Fong. "It's really just about being able to handle massive amounts of complexity, whether that complexity is in sheer amount of geometry or the complexity of the lighting... We've got our work cut out for us and we're trying to rise to the challenge," he adds. With a unique team that gets to test its renderer in production at the best animation studio in the world, we can't wait to see what it comes up with.



The advanced Layered Material shader system uses substrates like diffuse, metal, SSS or glass

As shown on this example of human skin, a new RIS shader dedicated to creating realistic subsurface scattering currently ships with RenderMan

Non-Commercial RenderMan

Julian Fong tells us his why the newly released Free Non-Commercial RenderMan is an essential piece of software for aspiring artists

"The biggest advantage I can see is that from the get-go, with the latest iteration of the product, you get really good production quality shaders. So what that means is we've got a really good skin shader, we've got a good hair shader. That means you can load a preset and easily get the physical properties of a material like copper or wood or leather. So you can sort of just drop in a material property, put in a few lights, and now you can get to pretty much what you would expect from the real property in real life, taking into account full global illumination."

KeyShot® 5

Amazing renderings and animations. In minutes.

Export your model from ZBrush

Apply your materials in KeyShot

Choose any HDRI to light your scene

KeyShot is widely recognized as the fastest rendering software on both Mac OS X and Windows for look dev, pre-viz concepts, promo art and production visuals. KeyShot is the speed you need.

Model by Darkcurses
Turbosquid.com

Download KeyShot at
keyshot.com/try

INSIDE LAVA
AN INTERVIEW WITH JIM MURPHY

We talk to the director behind Pixar's upcoming new short to discover what it takes to turn a volcanic island into a sincere love story

As the short that is playing in cinemas right before *Inside Out*, 'Lava' is in many ways exactly what you'd expect from Pixar. A story about love, it's told in a simple, beautiful way, and made by a team that was obviously incredibly passionate about the subject.

In other respects, however, 'Lava' is completely different to any short film the studio has ever produced. For one, the main characters Uku and Lele also happen to be the sets themselves: they're a pair of volcanoes whose love story plays out over millions of years throughout the film.

Then there's Jim Murphy. Inspired by his love affair with Hawaii, which started after he'd first been there on his honeymoon 25 years ago, Murphy based the idea for the story in 'Lava' on a real underwater volcano in Hawaii (the Lō'ihi Seamount) that is estimated to slowly rise to the surface to join the Big Island in the next 10,000 to 100,000 years.

He then aimed to take things a step further with the Hawaiian inspiration by letting traditional Hawaiian vocals and lyrics drive his short. Murphy wrote out the whole song and lyrics to go with 'Lava' himself, and when it came to pitching the idea to John Lasseter, he simply sang it all right in front of him with his ukulele instead. Eight months later, 'Lava' got green lit for production.

How did John Lasseter react when you pitched your idea?

Of the three ideas I pitched, John liked this one best – he loved the originality of the story, that it was driven by music, and that it's about scale. It's about the characters being land masses and mountains over millions of years, and he said "Scale is something we're not very good at with 3D animation and at Pixar so it's something I'd really love you guys to push."

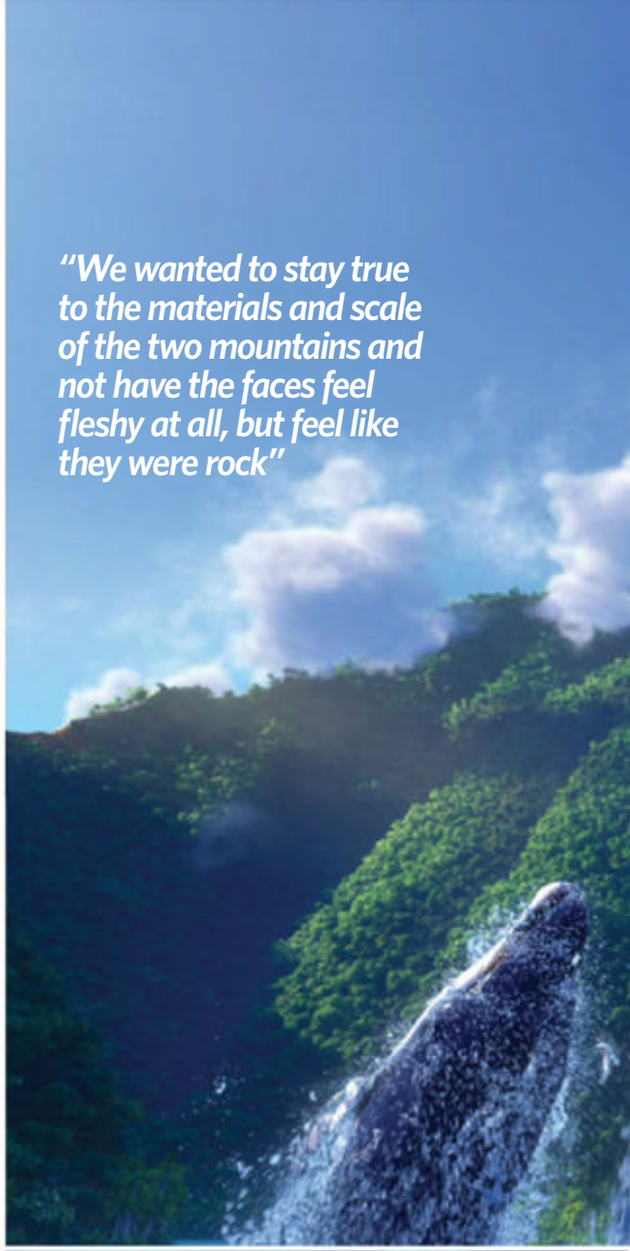
Was it a huge challenge to animate volcanoes that could sing and appear to be mountainous at the same time?

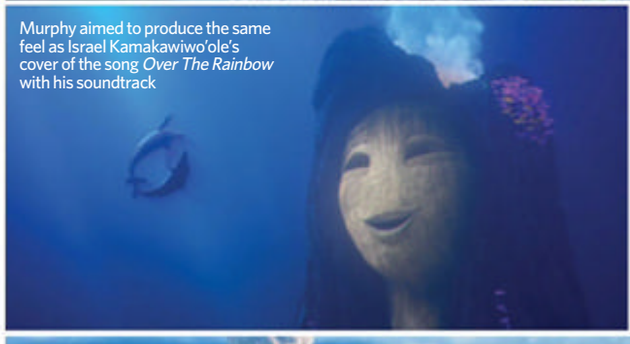
We wanted to stay true to the materials and scale of the two mountains and not have the faces feel fleshy at all, but feel like they were rock.

We didn't squash and stretch the characters at all, or if we did we tried to really hide it. We also ended up doing experimentation on making the character's face only move in these vertical plates, so for instance the eyebrows are like three giant rocky ledges that just slide up and down vertically.

One of the things we found out about achieving a sense of scale is we couldn't really move our cameras any faster than a real helicopter, because as soon as you went faster than a real helicopter you instantly make the volcano look like a toy.

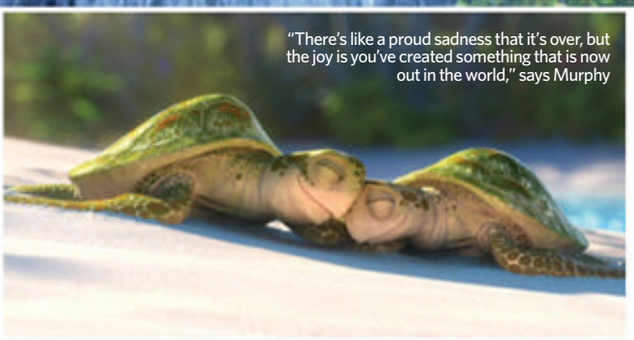
"We wanted to stay true to the materials and scale of the two mountains and not have the faces feel fleshy at all, but feel like they were rock"



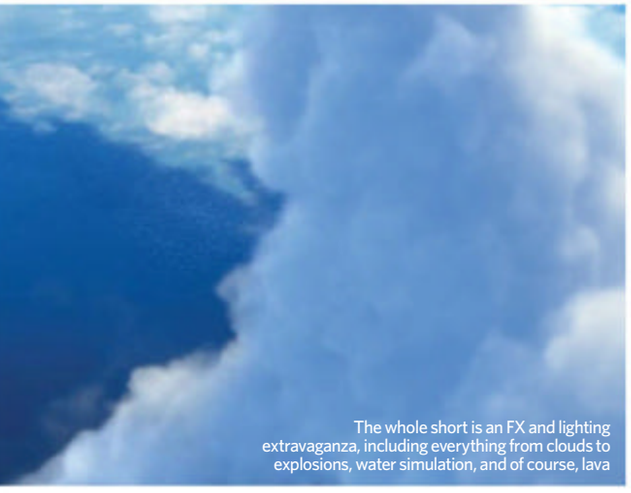


Murphy aimed to produce the same feel as Israel Kamakawiwo'ole's cover of the song *Over The Rainbow* with his soundtrack

Murphy compares making a short to raising children, "You have visions of [their future], but... they are who they are and you have to help them become the best they can be!"



"There's like a proud sadness that it's over, but the joy is you've created something that is now out in the world," says Murphy



The whole short is an FX and lighting extravaganza, including everything from clouds to explosions, water simulation, and of course, lava

STORYTELLING ADVICE

Murphy reveals what he would tell other artists hoping to create a unique short

"For me it's all about picking stories on things that you love so much and that you're so fascinated by that you can't stop. You never get bored of learning about it," says Murphy.

"For 'Lava' I was making these discoveries about geology and the history of these islands, and I learned there's this great tree called the ohia tree – it's the first tree that grows after a lava flow and it produces this flower called the lehua flower, which is very famous. So the little forest that becomes the flower in Lele's hair in 'Lava' is an ohia forest! It's just the little tiny details that really make you passionate. They nod to something genuine."

Were there any shifts that really reshaped the way 'Lava' ultimately turned out?

There were a lot! In the initial pitch I had this whole heart-shaped lava chamber, so that you could see a cross-section of the Earth and the volcanoes in a long shot, and then you would see that they had magma chambers that were filled with lava in the shape of hearts.

It was terrific as a visual, but then when we tried to make it work in the storyboards it didn't work because it kept taking our attention away from the main characters. We tossed that out.

Did you only use in-house software throughout production?

The idea with these shorts is to try some different software, or different ways of doing things on a short, then hopefully you can implement the tools or whatever it is that you're testing on a feature film after it's been road-tested.

In 'Lava' there were also a lot of things we tested with vegetation, in terms of this is the first time we've had moving sets that not only had a bunch of vegetation, but also had effects on them as well. We also tested a lighting tool on this called KATANA. It was used on 'The Blue Umbrella' and we used it on 'Lava'.

There were also a lot of things done with clouds and with the time lapse where the layout, the FX guys and the lighting team learned a ton [of tricks that] they are implementing into future shows.

Would you be excited to direct more shorts at Pixar for the future?

Yes! I just want to keep making stuff and to keep making things that I'm passionate about and that's what I'm working on right now, coming up with that next thing that I just can't stop thinking about.

All images © Disney Pixar

Technique focus

Incredible 3D artists take us behind their artwork

SADNESS "Joy doesn't quite know what Sadness is about," says co-director Ronnie del Carmen. "Like a lot of people... we don't believe that sadness is something that we should foster. When somebody is sad we want to cheer them up right away." Joy and Sadness get lost in Riley's mind through the film, leaving the other emotions to fend for themselves.

[RE]VOLUTIONARY

CALL FOR SUBMISSIONS

Submit your work & be a presenter at SIGGRAPH Asia!

SIGGRAPH Asia 2015 invites you to submit your works and showcase your outstanding creative ideas and innovations at the 8th ACM SIGGRAPH Conference and Exhibition on Computer Graphics and Interactive Techniques in Asia, taking place from 2 – 5 November 2015 in Kobe, Japan.

Log-on to **sa2015.siggraph.org/en/submitters.html** to submit your works.

Conference Programs' Submission Deadlines*:

27 May 2015	**Art Gallery**
2 June 2015	**Computer Animation Festival**
10 May 2015	**Courses**
9 June 2015	**Emerging Technologies**
9 June 2015	**Posters**
9 June 2015	**Technical Briefs**
2 June 2015	**Technical Papers**
12 June 2015	**Symposium on Education** NEW!
12 June 2015	**Symposium on Mobile Graphics & Interactive Applications**
12 June 2015	**Symposium on Visualization in High Performance Computing** NEW!
28 April 2015	**Workshops (Proposals Submission Deadline)**
23 June 2015	**Workshops (Papers Submission Deadline)**

* The submission time for all dates is 23:59 UTC/GMT

CALL FOR EXHIBITORS & SPONSORS

Be a part of the SIGGRAPH Asia Exhibition – Asia's Digital Media Marketplace

Meet over 7,000 technical and creative industry experts and individuals from over 50 countries and regions face-to-face to explore business opportunities, partnerships, and to strengthen existing relationships – all in person at SIGGRAPH Asia 2015. Book your stand now by 30 June 2015 to enjoy early bird rates!

Contact **Wyatt Lee, CEM** at **+65 6500 6725** or **wyatt.lee@siggraph.org** for more information on the exhibit space options and fees, as well as sponsorship packages.

CONFERENCE 2 - 5 November 2015
EXHIBITION 3 - 5 November 2015
KOBE CONVENTION CENTER, KOBE, JAPAN

SA2015.SIGGRAPH.ORG

Sponsored by
ACM SIGGRAPH

> "Everything from subsurface scattering, to caustics, to colour grading is all done in camera within a single pass"

Create still life with RenderMan

Get a preview of the key features in the upcoming release of RenderMan version 20 and understand common workflows

This tutorial will focus on lighting and look development in RenderMan for Maya. The goal is to introduce RenderMan's new RIS technology and show how the simplified workflows can deliver photorealistic results quickly. The objects that can be seen in this still life were chosen specifically to demonstrate a broad range of effects, concepts and workflows.

This tutorial also serves as a preview for many key features coming in the next release of RenderMan 20. In the next month Pixar plans to launch the new version, and by reading this tutorial you can get a taste in advance of what's coming.

While RenderMan is quite capable of producing custom secondary passes for compositing, in this tutorial everything is rendered 'in camera' during one pass. There are no prepasses such as shadow maps, point clouds or whatnot – everything from subsurface scattering, to caustics, to colour grading is all done in camera within a single pass. There is no use of NUKE or Photoshop, and the only postprocess is the amazing new Denoiser (which we will talk about in more detail in Step 15).

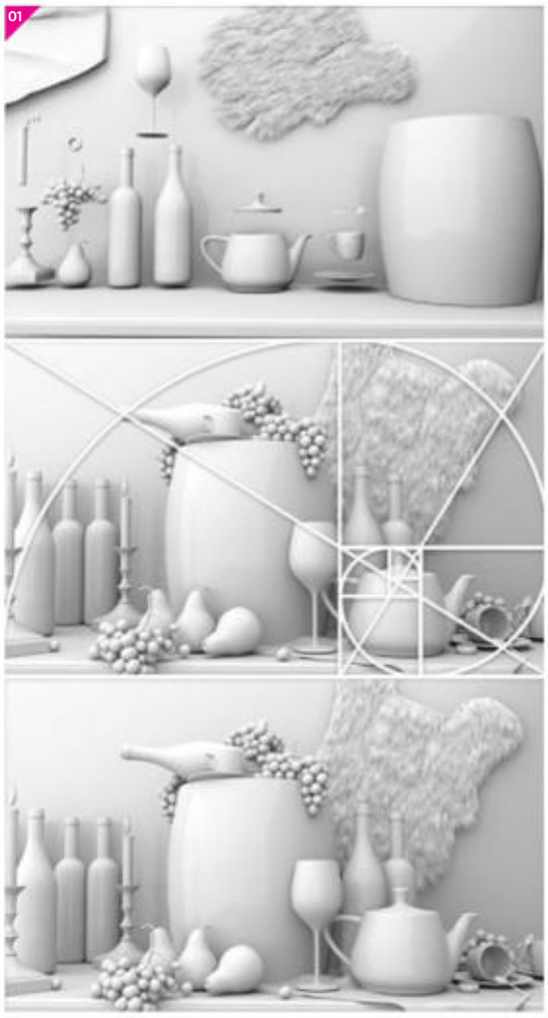
When the new version of RenderMan 20 is released in the next month, you can try it out for yourself. If you're not already a RenderMan user, you can download the Free Non-Commercial RenderMan to follow the tutorial.

DYLAN SISSON
Arrangement with Utah Teapot No1, 2015

Software
Maya, RenderMan

Learn how to
- Do interactive rendering
- Light a scene
- Develop a look
- Apply camera effects
- Use the Denoiser
- Render fur
- Use emissive geometry

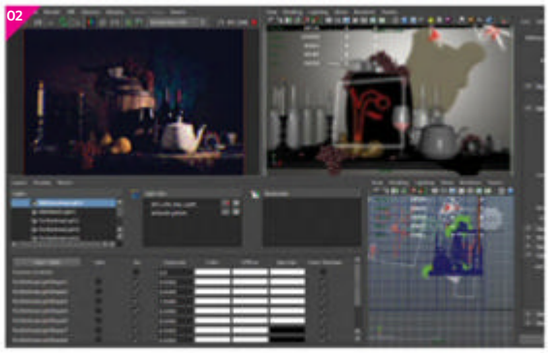
Concept
The hero of this still life is the original Melitta teapot that Martin Newell purchased in 1974 in Salt Lake City, Utah, which he used as reference to create the popular CGI model, the Utah Teapot.



02 Interactive rendering The majority of this project was created during interactive rendering sessions to leverage the acceleration that RIS technology provides for both lighting and look development. Interactive rendering makes lighting setup fast and natural. The special RenderMan Lighting Panel makes working with lights efficient – all you have to do is just edit the intensity of groups of lights all at once and bookmark your favourite light settings as desired. From the UI, you have the option of starting an IPR session in Maya's Render View or using Pixar's own image tool 'it'. Interactive rendering can be a real time-saver.

03 Geometry It's always a good idea to check out the geometry in your scene at the beginning of a project and make sure that there's nothing too abnormal lurking about, and an upcoming feature that will help us with this in RenderMan 20 is a new Visualizer Integrator which enables scene geometry to be viewed the same way that RenderMan 'sees' it. You can visualise things like wireframes, normals and so on. Because the Visualizer is extremely lightweight it can be used to manoeuvre through highly complex scenes during an interactive render. So first, you just need to start up an interactive render and then go on to select the Visualizer Integrator from the Sampling tab in the globals and look at the scene. For our project the wireframes check out, but if there were issues with the geometry or parameterisation, that would also be apparent to us here.

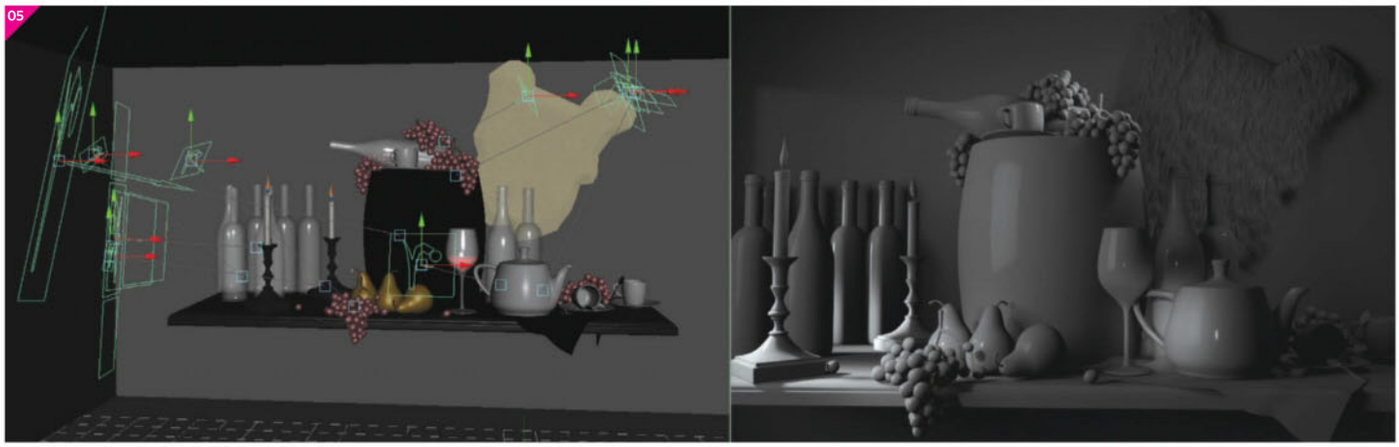
01 Compose the scene The main subject of the still life is the teapot, which was modelled using photo references from the internet. Other models were then added to the scene to show specific features and effects: a rug to show hair rendering, fruit to show subsurface scattering, a candle to show emissive volumes and so on. This became quite cluttered, so to properly direct the eye it was important to create a compelling composition. For this particular image, the golden ratio was used to guide the placement of the objects. An image of the golden ratio was attached to the camera plane in Maya and used to quickly lay out the objects.



Subdivision Surfaces
Pixar did the original research and development for subdivision surfaces, and recently promoted this standard for subdivision surfaces with the Open Subdiv project. Open Subdiv is a set of open source libraries adopted in Maya and across the industry – the subdivision surface you see in Maya will be the same as RenderMan's. You may choose to work with Maya's subdivision surface primitives or simply work with a polygonal mesh and render it as a subdivision surface by attaching special attributes to the geometry (the method we used here). RenderMan translates creases on poly meshes, so complex topologies like the candlestick can be modelled. Tip: for easy setup, try smoothing any poly mesh (by pressing 3 in Maya) and RenderMan will treat it as a subdivision surface – no extra attributes required.

YOUR FREE DOWNLOADS
from **filesilo.co.uk/3dartist**
- Maya Scene File
- Tutorial screenshots

04 Make the Key Light First, create a Key Light to direct the viewer's eye. For maximum control and efficiency RenderMan has its own specialised lights, and we'll create one from the RenderMan menu (PxrStdAreaLight) as the Key Light. Start up an interactive session (RenderMan>IPR Render) and select the light. To create a dramatic effect, position the light to the right of the table and focus it on the teapot like the image. Now dial in the lighting for the key: increase the exposure, adjust the colour temperature, narrow the light profile to tighten the illumination, and enable 'barn doors', which provides fine control for constraining the light.



05 Create fill lights To emphasise different elements of the composition we can use fill lights to highlight specific objects. With the interactive session running from the previous step, simply create more lights and then position them as you see fit – for example if you want to fill in the teapot, to cast highlights on the grapes or to add rim lighting the candlestick. In order to 'paint' a specific object with light, like the teapot for example, an extremely tight Light Profile can be used (such as a setting of 10) which will enable the light to illuminate the teapot, but not any of the objects that are adjacent to it.

06 Lighting transparent objects Next, make sure that the wine glass renders properly. In order to achieve good results in the most efficient way, make sure you pay attention to the 'Max Specular Depth' setting in the Sampling tab of the globals. For a ray to travel all the way through the wine glass, it must pass through at least two surfaces before exiting. In the image you can see the results from a 'Max Specular Depth' of 2, 4 and 8. If Max Specular Depth is set incorrectly you may see black areas in the glass. Note that 'Max Specular Depth' can be assigned on a per-object basis from the RenderMan Attribute menu.

07 Create caustics For the wine glass, it's desirable for light to refract through the glass, but notice that when the Path Tracer integrator is enabled via the Sampling tab in the globals, the shadows that are cast by the wine glass are solid black. Path tracers simply aren't that good at rendering caustics, so RenderMan provides a VCM integrator which uses bidirectional path tracing to efficiently resolve caustic effects for both transparent and reflective objects. Switch to the VCM integrator and that's all you need to do. In the image you can see caustics are automatically generated for the wine glass and the golden rings.

RIS and Reyes

It is important to be aware that RenderMan essentially has two rendering modes, RIS and Reyes, within the same software. This tutorial uses the new RIS renderer. RIS is highly optimised for rendering global illumination, specifically for ray-tracing scenes with heavy geometry, hair, volumes and irradiance using single-pass workflows. Because of differences in their architectures, it's important to be in RIS mode when following the tutorial. While Reyes adds additional functionality, RIS is completely new technology that has been developed to take full advantage of modern hardware for physically based ray tracing, featuring intuitive tools, simplified workflows and photorealistic results.

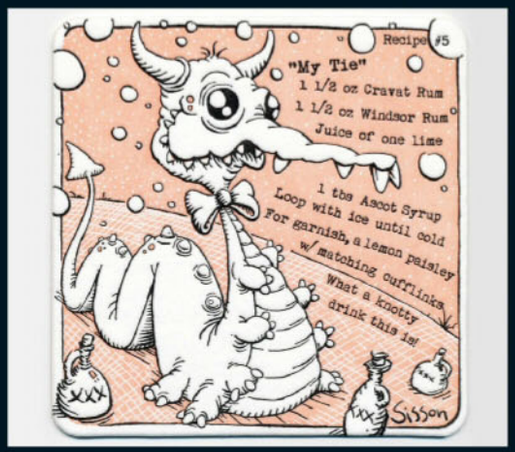
Showcase

Dylan Sisson

Dylan Sisson combines 15 years of experience in 3D animation and VFX with a traditional background of painting and illustration. He's created paintings, illustrations and vinyl toys that have been shown in galleries around the world, and his independent animated shorts have won several awards.

Idle Hands **ZBrush, Maya, RenderMan (2015)**
Idle Hands is a limited edition vinyl toy collectable designed and sculpted by Dylan Sisson and produced by Toy Tokyo.

Walking Teapot **Maya, RenderMan (2014)**
The RenderMan Walking Teapot was created by Dylan Sisson. This rendering is a mockup created for the 2014 model design.

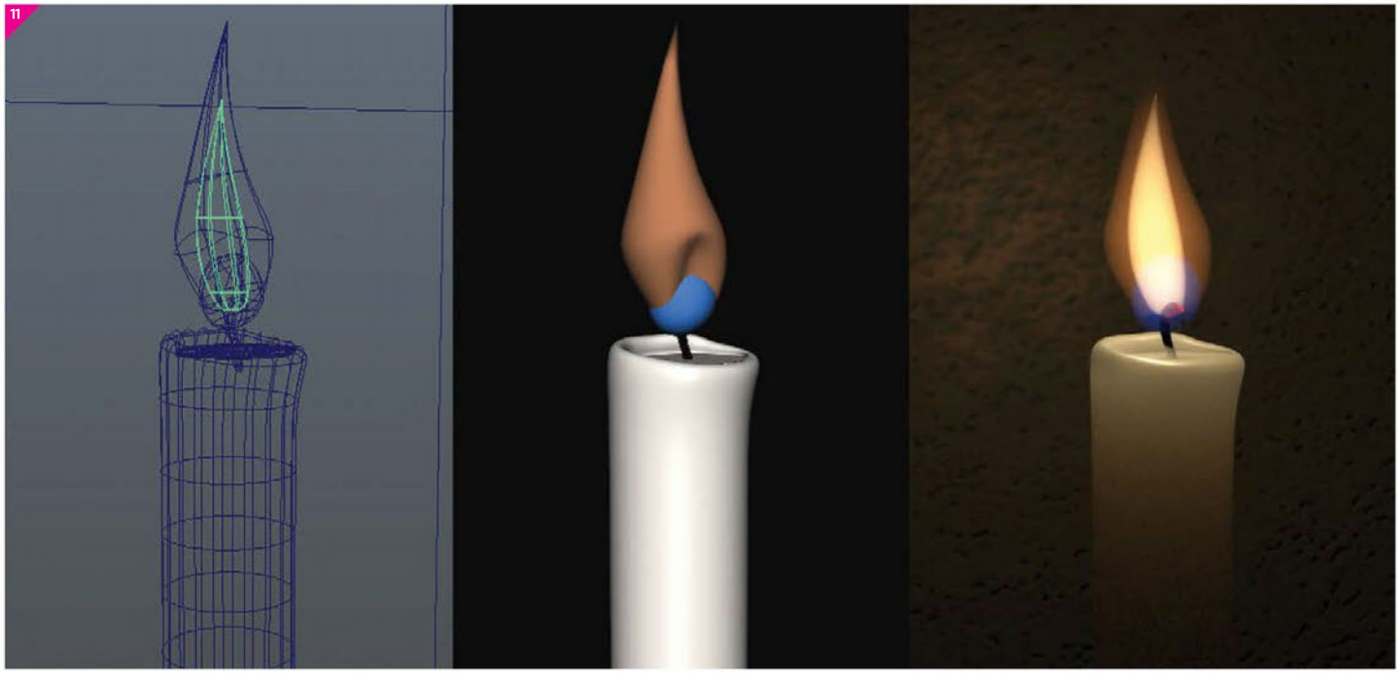


My Tie **Corel Painter (2013)**
Part of a 'cocktail recipes gone wrong' series, this art coaster was made digitally and printed on a letterset press.

08 Subsurface scattering for the teapot The main quality of the ceramic Utah Teapot is its translucent surface, which we can replicate with subsurface scattering. In this still life, subsurface scattering was used as the base material for the teapot, teacups, grapes, pears, candles and wooden barrel. To simulate any of these surfaces, just use RenderMan's Layered Material System to create an LMSubsurface material. Three controls are provided for subsurface scattering (near, middle and far). With the addition of two specular lobes, with their own independent bumps, the LMSubsurface is capable of all sorts of looks. With interactive rendering, dialling in the right look is fast and intuitive.

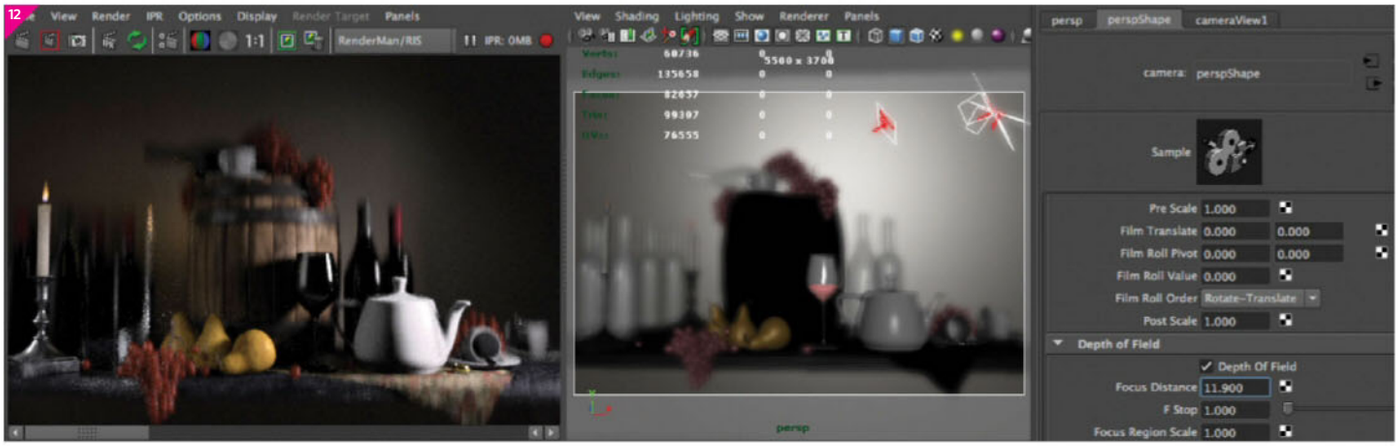
09 Wall rug – render Maya Fur First of all this is faux fur – no cartoon characters were harmed in the creation of this fur. RenderMan for Maya automatically renders Maya Fur and Hair, but what makes this fur special, is that it is rendered with a feature from the upcoming release – the new Marschner Hair shader created for Pixar production. That's correct, this is the first shader to ship from Pixar that was developed for an upcoming Pixar feature film. Marschner Hair delivers movie quality results and setting it up is simple – just attach the Custom Shader attribute to any Maya Fur description and add Marschner Hair.

10 Wine barrel – layer materials Here we'll use a layered material to create our wooden barrel bound together with metal bands. The geometry itself is simple, just a lightweight cylinder that flares out in the middle. First, a displacement shader is used to create the additional features using a texture map. Next, the base layer for the wood is created using an LMSubsurface node and it's given just the right amount of subsurface scattering and specular highlights to simulate wood. Finally, another layer is added on top of the wooden material to simulate metal, and it's then masked so that the bands appear metallic.



11 Candle flame – emissive volumes The candle flame was created using nested volumes and emissive geometry. To create a candle flame, first create an elongated sphere and attach a Volume Shader (pxrVolume), then on the Shading Group add a custom 'Area Light Shader' attribute and connect a Mesh Light. Now the elongated sphere will behave as any other light source, even though it is a volume with distorted topology. Next, place a slightly larger volume sphere around the first sphere to create the orange glow. Finally, add a sphere near the bottom of the flame and attach a blue volume shader. It's a quick method of building a flame.

> "This is the first shader to ship from Pixar that was developed for an upcoming Pixar feature film"

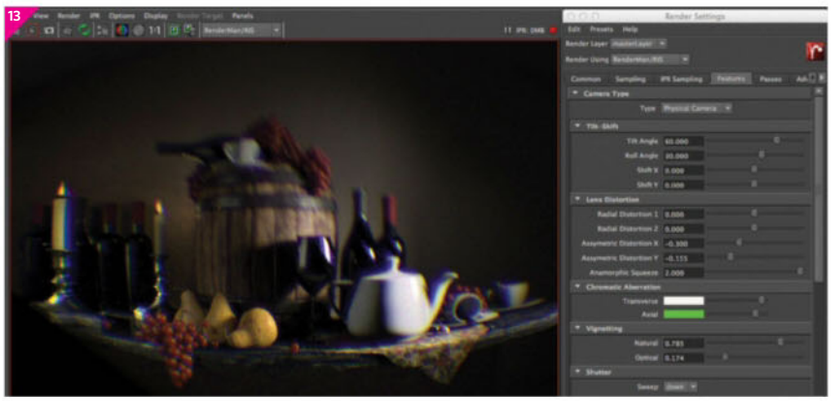


12 Get some focus With the scene nearly ready to render, it's time to add depth of field. Just enable depth of field in the Maya camera and RenderMan for Maya will automatically render it. Special RenderMan Aperture controls can also be added to any camera via the Attribute Editor, and these provide support for features like faceted bokeh and oval-shaped defocus. Tip: when dialling in depth of field, it can be useful to use the interactive renderer and for heavy scenes it can be fastest to use the Visualizer Integrator mentioned above to set the focus. For the still life it was important to keep the teapot in focus and slightly blur the background.

13 Create a physical camera In the real world, cameras are imperfect and can cause artefacts like vignetting. However, these imperfections can also give an image character. In the upcoming release, RenderMan now has a true Physical Camera which supports vignetting, chromatic aberration, lens distortion and tilt shift photography. For this still life the physical camera was an essential tool that was used to give the final render a look that is closer to a real photo. To set up the effect, simply enable the Physical Camera in the Features tab of the globals and adjust the settings as you see fit.

14 Add colour grading RenderMan has a class of shader called 'imager' which can be run at the end of a render, across the entire image. A common use for imager shaders is colour grading, for those times when it is desirable to render everything in-camera. This somewhat advanced step will involve loading an imager shader (slo) into RenderMan for Maya using a 'Frame RIB Box'. In the case of the still life the imager shader was created in Pixar's Slim, and this was then used to push the shadows toward blue and the highlights toward orange. With the imager set up correctly, we're now ready to render.

15 Render with the Denoiser Finally before pressing render, enable Denoise in the Sampling tab in the globals. The Denoiser was developed to address the issue of noise in physically based rendering (where images can take a long time to converge to a completely noise free image). Now, renderings can use fewer samples for faster renders, and when the rendering is complete the Denoiser is run on the image to remove any artefacts. RenderMan for Maya writes out additional information (AOVs) into a large multichannel image (EXR) for the Denoiser, which enables the Denoiser to only remove the noise. The Denoiser might just be the 'Make Pretty' button we've all been waiting for.



More questions?

This tutorial is just a start. A lot of ground has been covered to introduce some of the features in RenderMan's RIS technology and yet we've only scratched the surface. There simply wasn't enough space to thoroughly show each and every workflow, and the focus was placed instead on conveying a breadth of techniques. For further exploration, please refer to the scene files of the still life on FileSilo where you can closely examine the setups shown in this tutorial. RenderMan is also free for non-commercial use, so it's easy to begin exploring on your own. For more RenderMan resources please see **renderman.how**.

All tutorial files can be downloaded from: **filesilo.co.uk/3dartist**

ImagingInsurance

The right insurance for YOU?

With a full range of specialist policies for Photographers, Video-makers, Film Processing Labs and everyone involved in Image-making, Imaging makes insurance simple, effective and hassle free.

Imaging strives to give you excellent cover, service, security and value for money.

For a quote or more information, call Imaging Insurance now on...

01277 243016

Or visit our website...

www.imaginginsurance.co.uk

Imaging Insurance is a trading name licensed to Vantage Insurance Services Limited (VISL) by Niche Insurance Services Limited.
VISL is authorised and regulated by the Financial Services Authority. VISL is registered in England, No 3441136.
VISL's registered address is: 5th Floor, 41 Eastcheap, London, EC3M 1DT
Imaging Insurance can be contracted at: 2nd Floor, Juniper House, Warley Hill Business Park, Brentwood, CM13 3BE
Tel: 01277 243016, Fax: 0207 6558060, Email: info@imaginginsurance.co.uk

Redefining workstation graphics performance

AMD FIREPRO

SAPPHIRE
Professional Graphics Solutions

Media & Entertainment
AMD FirePro™ graphics are designed, built and thoroughly tested by AMD for creative professionals in the media and entertainment industries.

ISV Certifications
AMD FirePro™ graphics feature a **100% success rate** on first pass certification on known applications.

Rock Solid Drivers
AMD FirePro™ drivers are **Rock Solid** and certified with major media and entertainment applications.

Reliability
Every AMD FirePro product goes through **four** full rounds of quality testing, ensuring a robust, reliable hardware solution.

AMD FirePro™ W8100
-4.2 TFLOPS of compute power
-8 GB of Graphics Memory
-320GB/s memory bandwidth

AMD FirePro™ W7100
- 8GB of Graphics Memory
- 4 x 4K displays per card
- Equipped with 1792 cores

AMD FirePro™ W5100
- 4GB of Graphics Memory
- 4K support
- Quad-display connectivity

AMD FirePro™ Resellers

RENDA PROFESSIONAL WORKSTATIONS
www.overclockers.co.uk/renda

Workstation Specialists
www.workstationspecialist.com

SCAN computers
www.scan.co.uk

ARMARI
www.armari.co.uk

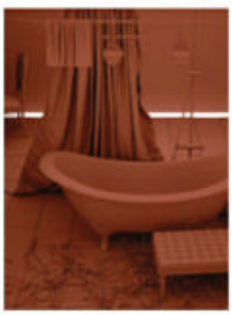
VOYO TECH
www.voyotech.co.uk

THIAGO LIMA
Pin Up Sex, 2014

Software
Marvelous Designer, 3ds Max, V-Ray, Photoshop

Learn how to
- Integrate photos into a 3D environment
- Correct light in the cutout
- Apply shadows to better integrate the photo
- Cut out a model from a photo
- Light a scene photorealistically
- Work in post-production with Render Elements
- Create extra channels with RenderMask
- Colour correct the scene
- Set up materials
- Set up models and displacement

Concept
This Pin Up Sex project is part of a collection called The Modern Pinups. I wanted to show some pin-up style girls in unexpected situations to push my skills to the limits.



YOUR FREE DOWNLOADS
from **filesilo.co.uk/3dartist**
- Final layered image
- Scene files
- Tutorial screenshots

Blend photos and 3D realistically

Seamlessly blend photographs of people into a 3D environment for a new take on creating unique 3D concepts

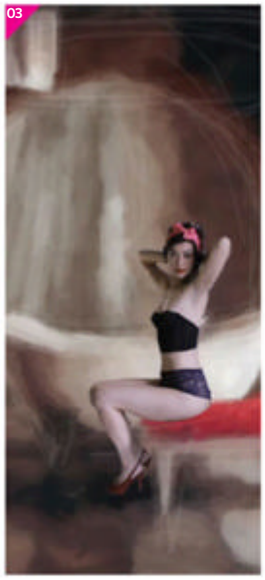
In this tutorial we will show you a workflow that goes through the modelling and postproduction processes of this scene, with creation done in 3ds Max and post-production in Photoshop. Here we'll explain how to model curtains and how to work with high-definition displacements and get a fast and realistic result at the same time. After that we will show you how to set up lighting based on the photo and some materials of the scene. You will also learn how to set up the render settings for a high-quality image with low rendering times. Then we will show you how to render separate selection masks with the plugin RenderMask to be used later in post-production.

Furthermore, we will teach you techniques for a perfect integration between a photo and a 3D rendered image, including cutting out and treating the photo without losing any detail, and correcting and balancing the lighting, vibrance, speculars and shadows. The process and workflow used in Pin Up Sex will help you in your own daily projects.

01 Choose your path Because this work is part of a bigger collection of images, some things had to be taken into account such as a recognisable identity between all the different images. All of the images in the collection contain a subliminal message: something obvious that is sometimes disguised among other elements of the scene. This is the third image collection in the series and the idea is that every new image needs to have some kind of challenge to be overcome. The greatest challenge in Pin Up Sex was to compose one person photorealistically and naturally in a 3D render that also has light sources coming from different directions.

References: use without moderation
Remember that for everything that is created in these scenes (in terms of modelling, lighting, materials, textures and even the mood for the postproduction), several references have been used. It is a common mistake to forget about them because our brain normally has a distorted memory of reality, therefore it's not always reliable to trust our memories. Just take care when you use a whole piece of work as reference, you should ask for usage permission or credits, and the same for if you wanna use some cut-out people in your scene.

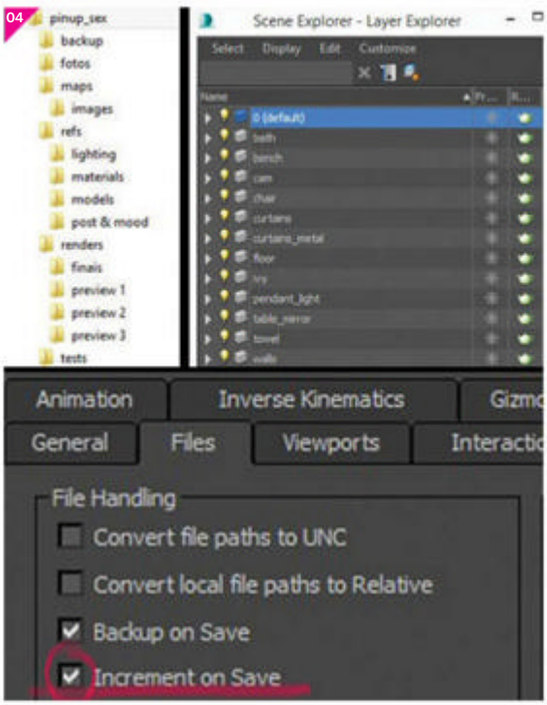
02 The shot This is one of the most important parts of this project. The photo of the model, Daniela Donato, was taken by herself and has no professional production – a lot of people don't think they can do high-quality projects without professional equipment. In the picture we have three main sources of light, one behind the camera, one over the table and one on the right side. This setup was intentional to practice a more complicated light setup for the 3D part.



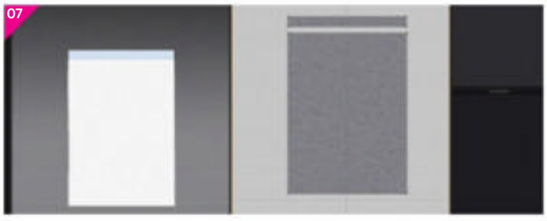
03 Do some sketches When you start to think about practical production, the first step is to do some sketches using the photo as reference, to inspire yourself and freely create your layout independent of premade assets. Also it's nice to think about what kind of concept, composition, storytelling and emotion you can bring to the viewer. Ask questions to yourself like: is she alone in this place? What is her mood now? Why is she there? Every new answer can guide you to a different composition of the same main concept.

“It’s nice to think about what kind of concept, composition, storytelling and emotion you can bring to the viewer”

04 Organise your files Before starting any project it's advisable to have a good organisation of your folders, especially regarding references and maps. It is also advisable to use layers to find and group objects in your scene as well as the use of the 'Increment on Save' option located in Customize>Preferences. This creates a new file every time your file is saved, leaving a backup in case of some mistake, a crash which corrupts your file or if you decide to go back to a previous stage of the project.



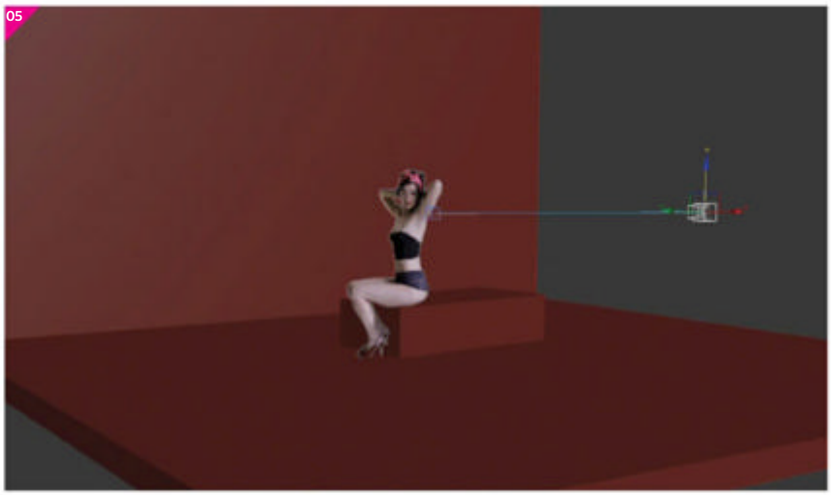
07 Start the curtains Inside Marvelous Designer 4, delete the default Avatar by going to Avatar> Clear all avatars. In the 2D viewport create two similarly width rectangles, a small one on top to serve as support and a larger one below which will be the curtain. Right-click on 2D View>Show Mesh to see the subdivision of the mesh, use the tool Sewing Segment and click the bottom edge of the small rectangle and the upper edge of the large rectangle to attach them with the seam. Right-click on the rectangle small in the 3D viewport, and then click Freeze. Press Space to simulate.

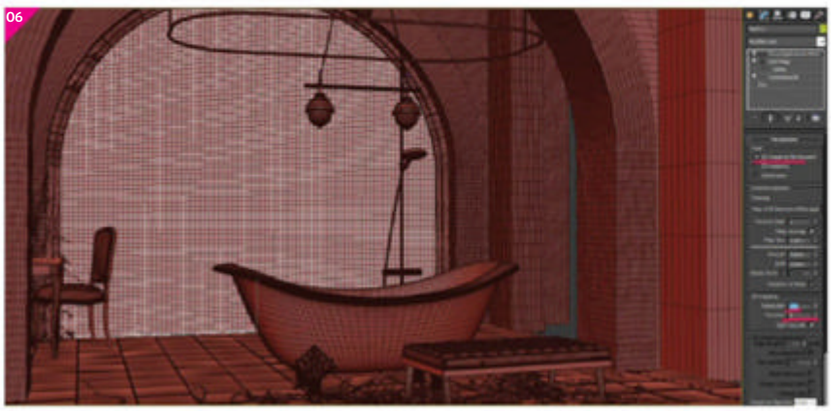


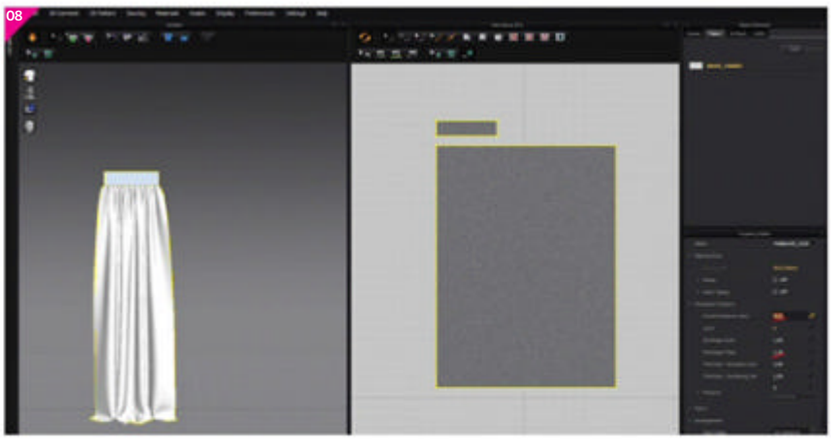
08 Finish the curtains Decreasing the width of the smallest rectangle, which is in Freeze mode, will wrinkle the curtain. Select both rectangles in 2D View, and decrease the value of Particle Distance to a subdivision you like. If your curtain is not touching the ground you can slightly increase the value of Shrinkage Warp to 1.10. Click and drag the curtain in the 3D View to position it as you like by holding W to create a pin to keep it there. Now export as an OBJ using the unit or scale that you are using in 3ds Max.

05 Set up the camera As we are going to create the whole scene based on the shot taken of the model we need to first set up the camera based on the camera of the original photo. You just need to know three simple things: the camera lens of the photo, the camera distance from the model and the camera height from the floor. So, you can imagine how hard it is when you're not the photographer because you need to guess everything. Depending on the scene you can also use Camera Match in 3ds Max to easilly create your camera.

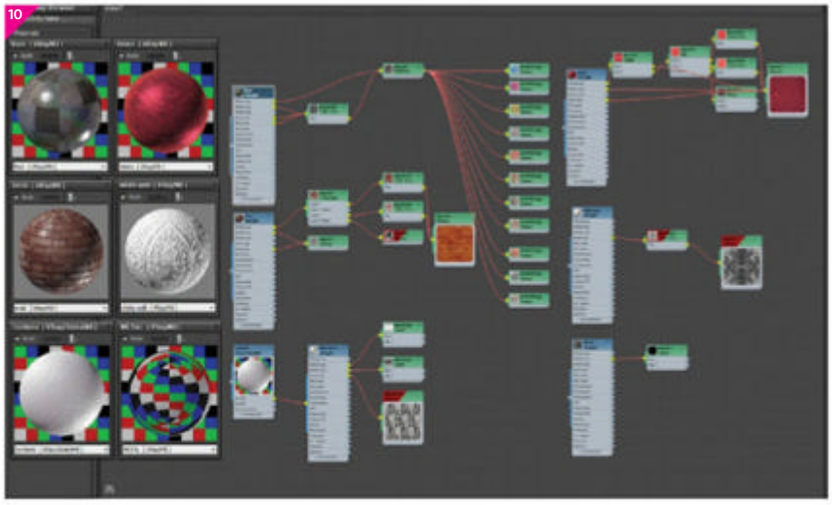
06 Modelling and displacement In the modelling process you can keep it simple.. Most parts of the objects had cubes as a base mesh and the floor had to be done separately as single tiles for easily varying the mapping and textures with the MultiTexture plugin later. You may have noticed that due to the displacement the subdivisions of the brick walls are very dense. This is because when you increase the subdivision of objects with displacement you basically ease the processing at the time of rendering so that you can use lower settings while maintaining quality and optimising rendering times.







09 Light the scene As we had control over the photograph taken by the model in this project, the lighting process for the 3D became much easier because we knew the exact amount and positioning of the lights in the photo stage. The parameters of the VRayLights are almost default, just modify the left light leaving it weaker than the light from the right. The light coming behind the camera will be created just from the light bouncing over the scene. The values of the light intensities are of the least concern since this intensity will vary widely due to the exposure of the camera and scene modelling.



10 Materials and maps Always keep the materials of your scenes as simple as possible; for almost every scene material that was used, only a map of Diffuse, Reflection and Glossiness were used with it. It is not always necessary to use a Bump map; the Reflection and Glossiness can provide a Bump-like effect, which helps to accelerate the speed of your render. You can see in the picture for this step that the MultiTexture map is applied to the floor material and also the simplicity of other materials. Try to keep eight subdivisions in all materials, increasing only if some noise occurs.

A drop of theory

Sometimes it may seem difficult to create a convincing and realistic material. In bases you need to look at just a few things, so, gather all the reference materials you can for what you want to create, in various types of lights and camera positions, and see how it behaves with parallel and perpendicular reflections – this reflective index will give you the intensity of Fresnel in your V-Ray materials. After that, use Reflection and Glossy maps to create a variation of areas that are more or less glossy or reflective. Control the percentage of influence on each texture in the Maps tab.

Showcase

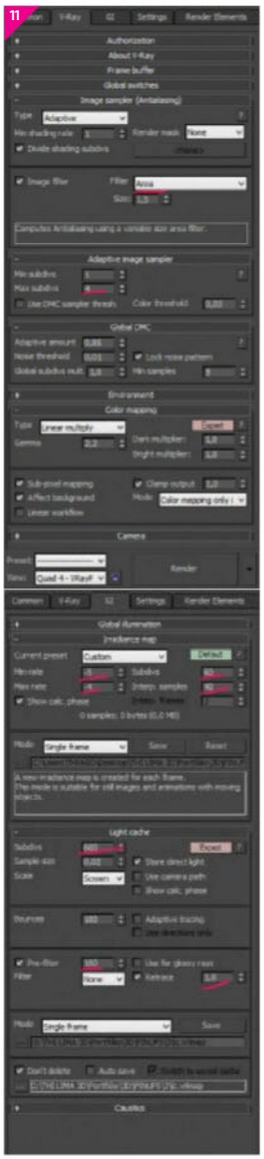
Thiago Lima

I am a graphic designer who started with 3D as a hobby seven years ago. After that I started to merge CG with my 2D works. Currently I am a generalist CG artist focused on workshops, lectures, online courses, consulting in CG field and photorealistic 3D freelance jobs for architecture and VFX.

The Last Pinup **3ds Max, Corona, Photoshop (2014)**
This scene depicts a moment from an alien invasion. This work was done to test the limits of Corona.

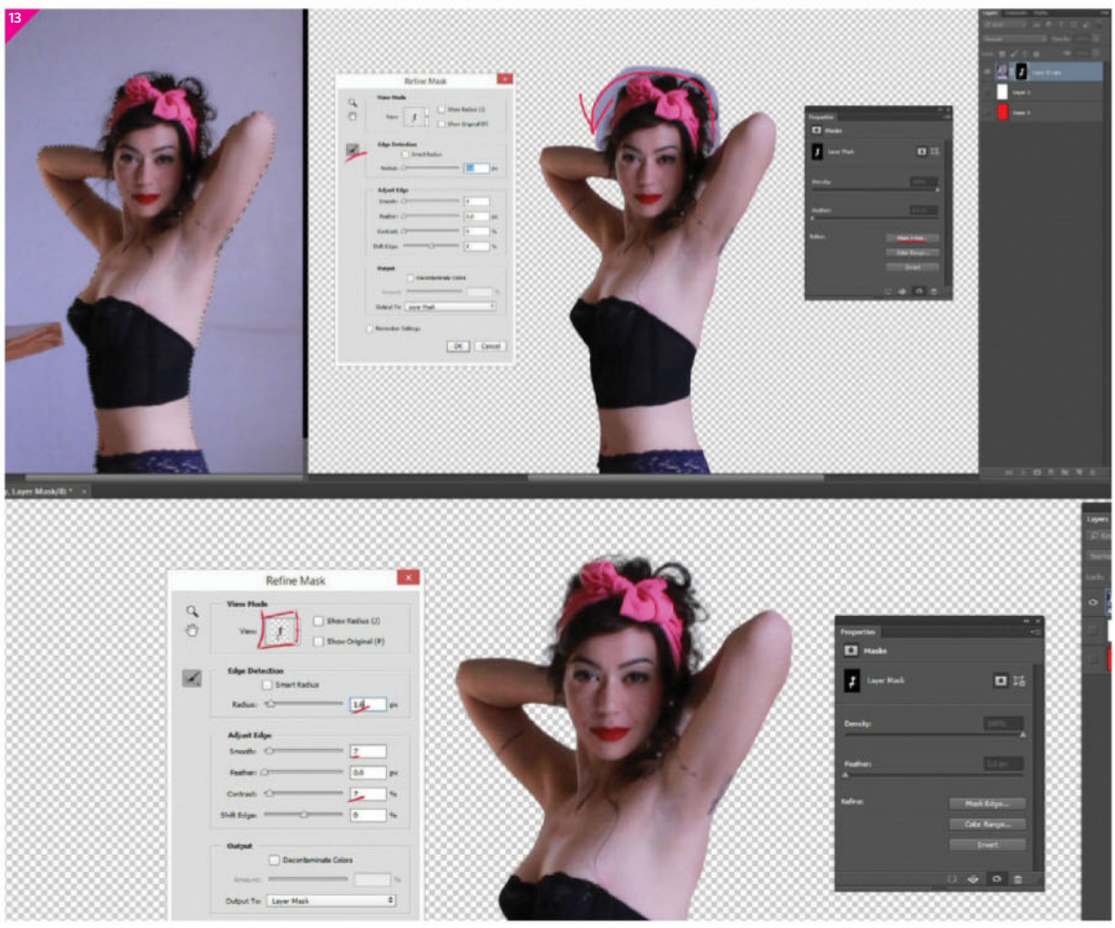
Pin up, Le Dernier Cafe **3ds Max, OctaneRender, Photoshop (2014)**
This scene depicts an apocalyptic scenario where a giant tsunami carryiynigng a transatlantic ship is invading Paris. This work was done to push the limits of OctaneRender.

Butterfly **Marvelous Designer, 3ds Max, V-Ray, Photoshop (2013)**
In this project I've created a home in a new way – it looks like half a butterfly and the other half is mirrored in the reflection.



11 Render settings We must understand render settings as a tool in order to optimise render time and fix errors, and not as something that will increase the realism of our scene – a render setting's high values do not result in a greater realism. So we can use very low settings remembering that the better lit your scene is, the fewer values you will need to increase in the render settings. A great tip with the antialias filter is you can use the Area filter with a size greater than 2.0 to bring softer edges with a real photography-like edge sharpness, depending on render output size.

12 Render Elements Here you can see how Render Elements is used in our post-production. The VrayRawLighting for example is one of the most important because we have a Direct Light channel without the influence of global illumination – it can increase the amount of direct light or even the overall contrast in a very efficient manner. You can use the plugin RenderMask to create an extra Alpha channel which will save you from doing a lot of work when editing objects separately. Don't forget to set the Min and Max Distance of the Z-Depth channel based on your scene depth.



13 Cut out the photo The cutting out of the model is not so easy, especially in the case of the small hair strands. A good way to start is using the Quick Selection tool to make a rough selection of the model, click Add Vector Mask in the Layers menu, double-click the mask created and then click on Mask Edge. Now brush over the scene with the Refine Radius tool to add the tiny hair strand details to the selection. You can play as you wish with the other options to better define your selection, the Shift Edge is one of the most important options as it controls the selection expansion.

> Global illumination can increase the amount of direct light or even the overall contrast in a very efficient manner

Post-processing the model

Use the cutout file to make any necessary adjustments such as treating the skin, or removing blemishes, noise, colours. In this case it was doing an interesting brief treatment of the clothing colours and also the addition of higher sharpness in the image – for the latter you can use a very simple technique. Copy the layer of the woman, then apply the Filter>Other>High Pass. Change some of the values, keeping only the edges pronounced by using layer blends in the Overlay mode. You can control the intensity of the effect by changing the opacity.

14 Use Render Elements You can start working the light and contrast using the VrayRawLighting element with the blend mode in Soft Light, and use RenderMask to change the desired areas. Change the Opacity to control the incidence of the effect. The amount of time that you use to work on each element is purely up to you. Furthermore, balance the levels of white and black, and saturation, then think about the importance of each element in the scene with regards an eye's natural path. For example, in this scene, a layer was created to desaturate the bench so that it balances with other scene elements.

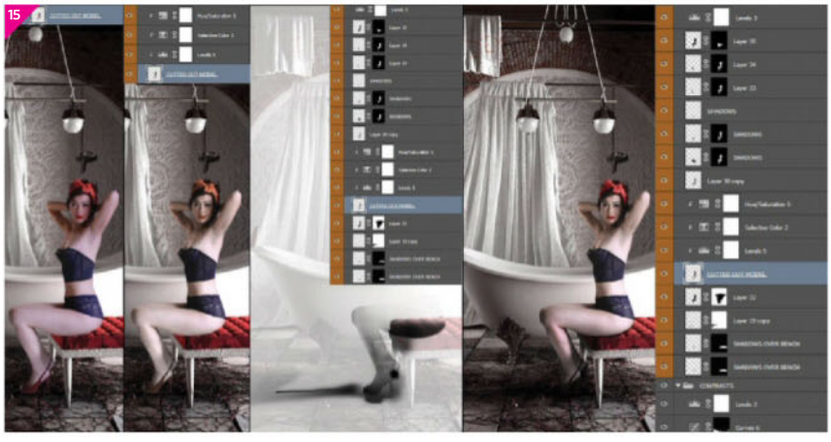
15 Compositing the girl To finish, add the Z-Depth Channel as an inverted overlay, it will make the background brighter than the foreground and direct the viewer's eye, and adjust brightness or contrast again. Place the cut-out model in the scene and adjust the colours, brightness, saturation using the Levels, Selective Color and Hue/Saturation. For the shadows select the model, paint them black in a new layer, reposition them and then add a Gaussian Blur to smooth the edges. Play with Multiply, Soft Light or Normal blend modes to see which fits better. Make the final adjustments with the model's colours and contrast.

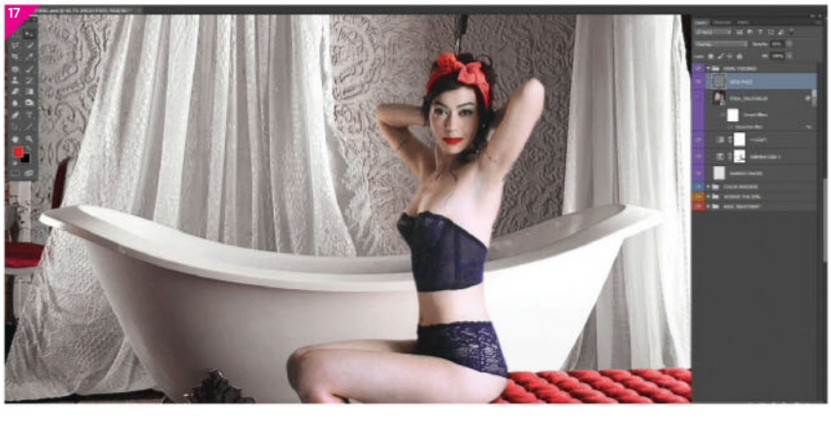
16 Colour grading This is the best part of the job when we can play with the colours and the emotions that the scene can provide us with. For the contrast you can use the Gradient Map Adjustment layer in Soft Light blend mode and tweak inside of those two. For colours you can use Curves, Color Balance and Selective Color, and work in each colour channel individually using shadows, midtones or highlights. Another thing to worry about is the level of sharpness of the model and the 3D scene, as both must be perfectly balanced so that it looks like a natural, seamless image. Also, use levels to tweak the whole composition equally.

17 Final compositing Well, is time to fix everything that you had previously left behind, and maybe return at some stage to anything that you may have exaggerated. In this case, it was necessary to add a little more darkness in the background chair so that it draws less attention in the scene. After that use Selective Color to bring the model's skin colour back. Finally you can copy all layers and merge all the copied ones – right-click on it and then use Convert to Smart Object so that any effect applied to this layer will be editable. You can use a Gaussian Blur and then increase the sharpness by using the HighPass filter.

Conclusion

It's always a good idea to organise yourself well at all stages, from modelling all the way through to completion. Try to work in sections, for example when creating your materials, you can make a scene with your desired lighting and a white material, and then you can create the materials one by one – just skip to the next material after the first one is perfect to you. Never forget about the references as they will save you time. Finally, do not be afraid to make mistakes: to change, lift off rules, numbers, parameters and so on. Photoshop can be awesome, so don't waste so much time on trying to get perfect raw renders.





All tutorial files can be downloaded from: **filesilo.co.uk/3dartist**

3DPRINTUK

FINE QUALITY SLS PRINTING SINCE 2011

X 119MM
Y 80MM
Z 238MM
£ 238.00+VAT

X 85MM
Y 56MM
Z 170MM
£ 86.79 +VAT

MAX PRINT SIZE
300MM X 220MM X 180MM
MATERIAL
NYLON (WHITE)

X 59MM
Y 40MM
Z 119MM
£ 31.00 +VAT

Not to scale. For reference only.

PROTOTYPES
Using our express service you can have your prototypes in hand in 4 working days.

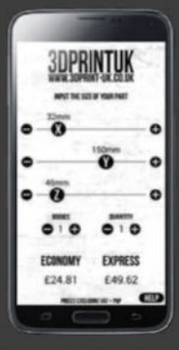
PRODUCTION RUNS
With SLS printing small is good. Hundreds of parts at low cost!

ORGANIC MODELS
New for 2015, professional model finishing. Please ask for more details.

INSTANT QUOTES
No need for an STL file, just use our sliding scale app to get an instant print quote.

DOWNLOAD OUR QUOTE APP

INSTANT QUOTES WITHOUT THE NEED FOR AN STL FILE



TO DISCUSS YOUR PROJECT PLEASE GIVE US A CALL AND SPEAK TO ONE OF OUR TEAM. MENTION "3D MAKE" TO RECEIVE 10% OFF YOUR ORDER*

E. HELLO@3DPRINT-UK.CO.UK T. 0208 692 5208 WWW.3DPRINT-UK.CO.UK

*This offer can not be used alongside any other discount or promotion offered by 3DPRINTUK.

Technique focus

Incredible 3D artists take us behind their artwork

DISGUST At first Disgust was designed to look disgusting, shaped like a triangle with a wart on her nose. Then the artists had a breakthrough: creating Disgust not to be disgusting herself, but to feel disgusted at things that would poison Riley, socially or otherwise. The character became very opinionated and now minds her appearance.

Special offer for readers in **North America**

2 issues FREE

When you subscribe*

FREE resource downloads every issue

Practical inspiration for 3D enthusiasts and professionals

8GB OF FREE ASSETS EQUIVALENT TO 12 DISCS
3DArtist
Practical inspiration for the 3D community
DRIVING THE 64-BIT REVOLUTION
ZBRUSH 4R7
12 DISCS' WORTH OF CONTENT

Order hotline **+44 (0) 1795 592 951**

Online at **www.imaginesubs.co.uk/3da**

Quote **SUMMER151** for this exclusive offer!

***Terms and conditions** This is a US subscription offer. You will actually be charged £37 sterling for an annual subscription. This is equivalent to $57 at the time of writing, exchange rate may vary. 2 free issues refers to the USA newsstand price of $14.99 for 6 issues being $89.94, compared with $57 for a subscription. Your subscription starts from the next available issue and will run for 6 issues. This offer expires 30 September 2015.

ANDREAS EBBESEN HOPEN
Dark Knight, 2015

Software
ZBrush, Maya, UVLayout, Substance Designer, Substance Painter, KeyShot, Photoshop

Learn how to
- Sculpt a highly detailed character in ZBrush
- Use Substance Designer and Substance Painter for texture and baking
- Optimise the character for any texturing
- Texture in Substance Painter
- Render in KeyShot using the new ZBrush bridge

Concept
I wanted to create a female dark knight, but I think it is important to not emphasise the gender. Brienne of Tarth in *Game Of Thrones* was a great inspiration for me.

YOUR FREE DOWNLOADS
from **filesilo.co.uk/3dartist**
- Tutorial video
- Custom Brush
- Alpha
- Tutorial screenshots

Sculpt a dark knight in ZBrush

Design a female dark knight with realistic medieval armour and render in KeyShot

To be able to create a dark knight character you will need to be familiar with ZBrush. Start by gathering a lot of references from the internet, create a collage, and then you can start sculpting! In ZBrush we will show you how to go from DynaMesh to a low-poly extraction that works really well. We will also be showing the normal sculpting techniques for sculpting a big form and the more detailed areas. It is always important to think of the big form first, and always check your silhouette! By doing so you will refresh your eyes, helping you to see the model differently which might help you in your character development.

This tutorial will show you some insight into how you can go about creating a dark knight. We will be using a base mesh to get the general proportion and go from there. In this case, a 2D concept has not been provided so we will have to create a new concept from this mesh.

01 Set your goals You can put a lot of time in the beginning into gathering as many pictures as possible on Pinterest, or anywhere else, of your preferred elements from fantasy and real knights. We decided to go for a female dark knight, but before designing this specific character, there were several concepts created where different types of armour were added to the design. It is also important to ask yourself questions during the creation process. We wanted to create somewhat realistic armour – something that will actually protect the character in battle. Many female characters out there on the internet are not suited for battle. They have been designed with aesthetic in mind and not practicality.

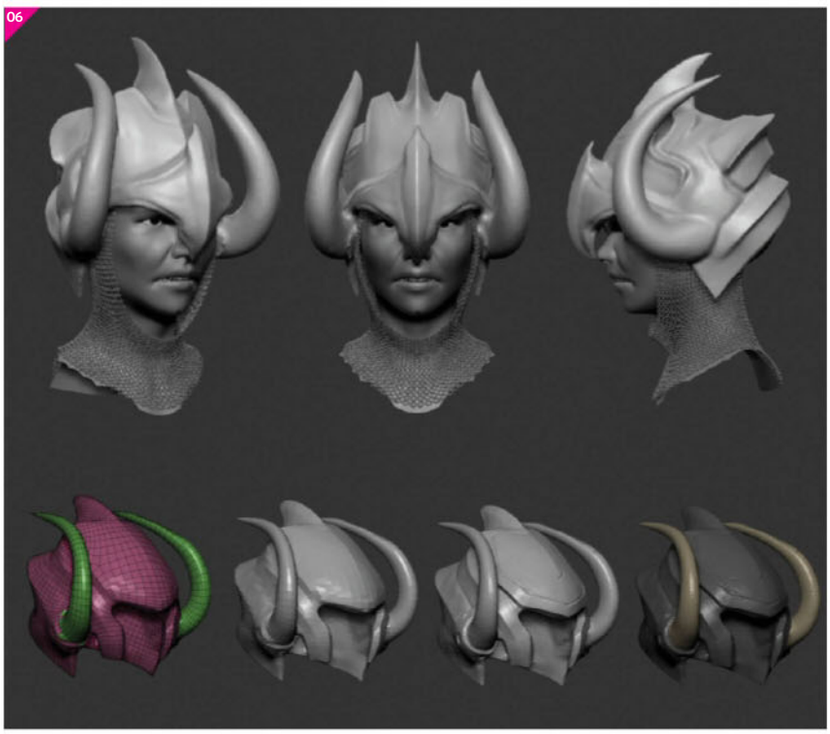
02 Start designing in ZBrush When starting with a new character, use a base mesh with correct proportions. DynaMesh your model and mask out the armour pieces. Convert your masks to polygroups. When you have made several polygroups on your model, hide the polygroups you don't want to extract. Duplicate your base mesh before extracting polygroups. In the Geometry menu, click on Edge Loop and go down to Panel Loops. Make sure the Loops are set to 1 and that Double and Append are active. Choose your desired thickness and click on Panel Loops. This will convert your polygroups to new individual meshes which you can split out from your mesh. Convert your parts to DynaMesh and start shaping pieces.

03 Work with big shapes Work on the whole model while you are designing. This is important to get consistency in the armour and to help you visualise the model that you are creating. By using DynaMesh, you are able to quickly produce 3D models and pieces without needing to think about the polygon count. This is a great way to constantly be able to make changes to the models you've already made and also, when using DynaMesh, you can go crazy if you want to! Check your silhouette often to see how it reads and to neutralise and refresh your eyes. It is easier to see where you need to make changes to the big form after you have switched back and forth, having taken a break in-between.

Texturing with Quixel SUITE
When texturing with Quixel's DDO you need the same maps as Substance Painter for maximum control. What I really like about the Quixel SUITE workflow is that you can use NDO to modify your Normal map and convert several of the needed maps inside the Quixel SUITE. You can also create a Normal map from scratch using only brushes within Photoshop and converting them using NDO. When all of your maps are done, and you are ready to import them into DDO, it will then do its thing for you. By clicking the Smart Materials button, many of the existing material presets, like leather, steel, plastic and so on, will be available. This is a great way of testing out different materials in different light conditions.

> Work on the whole model while you are designing. This is important to get consistency in the armour and to help you visualise the model

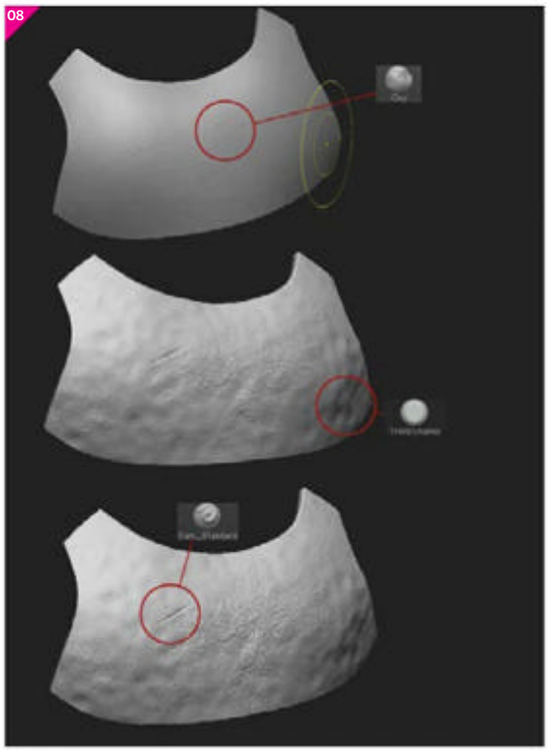
04 Model the armour When you are happy with the blockout, start refining each piece. We used TrimDynamic, ClayBuildup and Dam_Standard. If you need more details, add more DynaMesh resolution to the piece you're working on. However don't exaggerate the resolution as the mesh can get very dense and heavy to work on. Only do small steps at the time, like starting with the shoulder pauldrons first. Start by masking out the shoulder area, extracting and enabling DynaMesh for greater freedom, and from here start designing your ideas in Clay. You can work on both the x and z axis to achieve a quicker result for the shoulder pauldrons. The key here is to have good reference when trying to create a believable result.



06 Create the helmet To create the helmet we went back to the original base mesh, masked the head, and extracted it to a new subtool, converted it to DynaMesh and started to shape the form using Move, Dam_Standard and ClayBuildup. For the ClayBuildup brush, change the intensity to a value between 4 and 10 – this way you will have more control over the form.

05 Create the hands Here we've started working on the hand that ships with ZBrush. You can find it by selecting IMM BParts, clicking M, and choosing the female or male hand. By using IMM brushes, you can quickly get a base model to work from. Since we have sculpted the design in an earlier stage, we have now moved on to refining the hand armour. By using Move and TrimDynamic, you can easily achieve some great-looking armour plates. When the finger plates are done, we used ZBrush 4R7's new feature ArrayMesh to duplicate them to the other fingers. When you make changes to the finger plates you can see them across all ofof your fingers since they are instances.

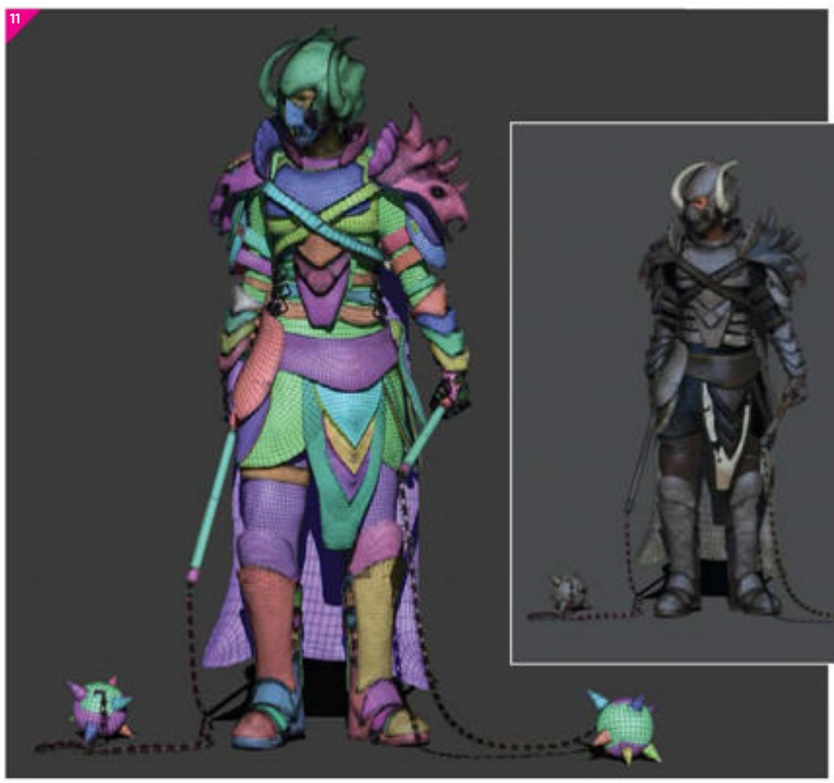
07 Scale the mail You can use Surface with a scale Alpha to visualise the scale mail armour, but we ended up using Alpha, the Standard brush and DragRect to place them manually. Since the scale mail is covered severely by the rest of the armour, you don't necessarily need to make the scales fit throughout the whole scale mail as you won't see it.



08 Create material surface It is important to sculpt the microsurface details on your armour to make it more believable, as leather and metal have two quite different surfaces. To create the leather, use a leather Alpha and Surface to apply the details over the leather piece you want to work on. Sculpt in scratches and damage by using Dam_Standard at a low setting. To create a metal surface, use the Clay brush, Intensity at 1, at a large size and choose Alpha 27. For the stroke, choose Spray. This will give you random distribution of the Alpha on your mesh. To add microsurface details, use the texture in Lightbox>Texture>IMG488.jpg and convert it to an Alpha. To apply it to your mesh use the Standard brush with DragRect, select the converted Alpha and apply it across your model. We tend to add some radial feather on the Alpha in Alpha>Modify and change the RF slider to something between 10 to 20. When you are happy with the surface details, use Slash3 or Dam_Standard to add cracks and cuts. To accumulate the effect of it being hammered by by the blacksmith when it was made, use TrimDynamic with the Spray stroke and Alpha 48 with a low intensity.

09 ZModeler Prior to 4R7 you had to use a traditional 3D package like Maya or 3ds Max to attempt box modelling, or you had to do box modelling in ZBrush by using the Transpose brush, which was a real hassle. However, with the new ZModeler brush in ZBrush, you can do box modelling without any technical constraints. ZModeler focuses on you as an artist so that *you* can focus more on being creative.

10 Make the weapon using ZModeler To create the flail, you will need to choose a new tool. In Make PolyMesh3D, click on Initialize which is located towards the bottom of your Tool menu. It is important you do it in that order, otherwise the Initialize will show you a different set of options. Choose QCyl Y and choose the ZModeler brush via the B-Z-M shortcut. Then hover over the poly, drag it and it will automatically start extruding the polygroup. To add more edge loops, hover your brush over the edge, make sure the Insert button is active and right-click, if you don't release the right-click, you can slide the edge loop to your desired location between the two other edge loops. This way you can create some intricate forms.



11 Topology After you have finished the modelling, it is time to clean up the scene and prepare it for UVs and retopology using ZRemesher and Maya. When retopologising hard surface parts, like the armour plates, GoZ can be very efficient for use between ZBrush and Maya, and back again to ZBrush when the topology is done. If the piece you are working on has too many polygons, a great way to reduce the count is by using the Decimation Master which can be found under ZPlugins.

Showcase

Andreas E Hopen

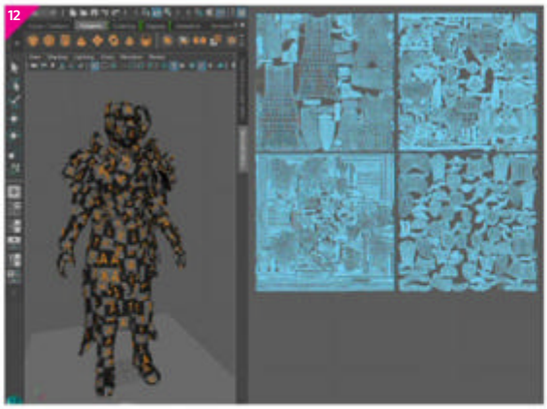
I am a character artist with a great passion for art. I strive to become a better artist and I get my inspiration from the people around me. The feeling of not knowing what I will create during a day is, in itself, for me a great inspiration and motivation.

Female Samurai **ZBrush, KeyShot (2014)**
I really wanted to create a female samurai. I asked myself a question of what kind of armour she would have if she was the shogun or emperor's daughter.

Survival Suite **ZBrush, KeyShot (2014)**
The Survival Suite image is a concept for an on-going personal project. However it has been put on hold because of a lack of time, but I really want to start working on it again. It is sculpted in ZBrush and rendered in KeyShot.

Iron Man **ZBrush, Quixel, V-Ray, 3ds Max (2013)**
The Iron Man was a personal project where I wanted to learn how to do hard surface modelling in ZBrush. It was a tough learning curve, but it was an inspirational and educating project. Texturing was done with the old DDO from Quixel and rendered by a good friend of mine using V-Ray and 3ds Max.

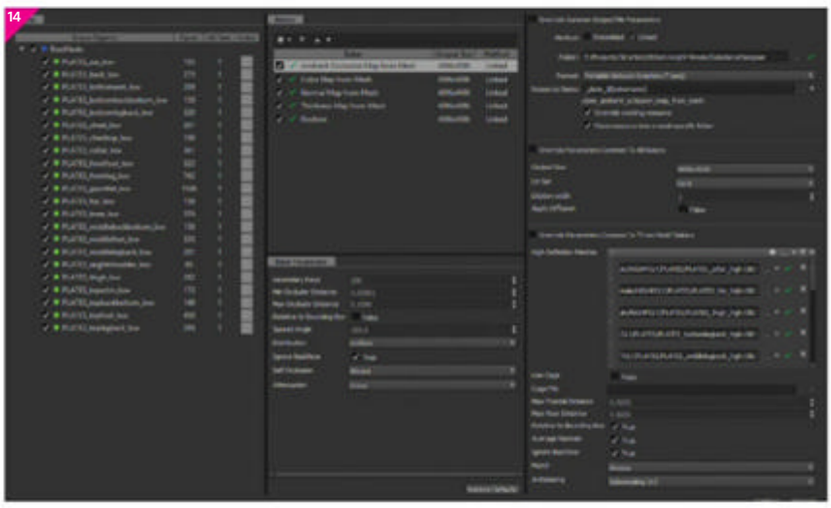
12 Prepare UVs Decide how many UV sets you need for the model. We ended up with four for the armour, and one for the head, mouth and eyes since we haven't focused on the face in this image. For the UVs, we mainly used headus UVLayout and for some parts, UV Master in ZBrush. For the UV straps, headus is great! UV Master on the other hand is a really quick way to get new UVs. By using polypaint you can guide ZBrush to where you want the plugin to apply UV cuts.



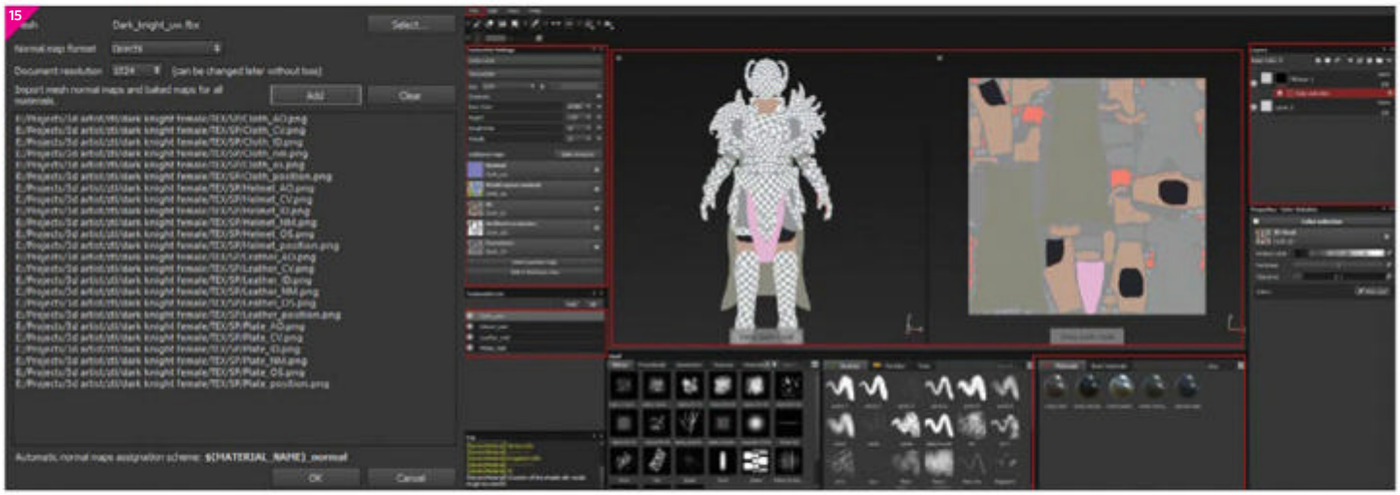
Optimising your project

When working with scenes in ZBrush with many million polygons the viewport can get a bit slow. There are two methods that can avoid this. The first one is by using the Decimation Master on your models: you'll maintain the details and overall form, but you can reduce the amount of polygons significantly. The other method is to create a low-poly mesh where you project your details onto it. Duplicate your mesh, turn your DynaMesh slider down and re-DynaMesh. Use the last step to get the details back or you can create a retopologised version using ZRemesher or the Topology brush.

13 Export from ZBrush Now export as high-poly models from ZBrush with your polypaint. Make sure to have Colorize active, this way you can bake a Colour ID map in Substance Designer. Also, make sure Grp is turned off under the Export settings. If you have any UVs on your mesh, delete those too as it will speed up the entire exporting process.



14 Bake Import all your maps to Substance Designer, like your low-poly mesh, and start the baking process. What we like about Substance Designer is the control and overview of the whole process. Before, we used to use xNormal to bake, Photoshop with NDO (Quixel Normal map creation plugin) to merge the maps together and to view the final result on the model, we used Quixel 3DO. You can still get a good amount of control with this method but Substance Designer is more efficient as you can do everything in one program.

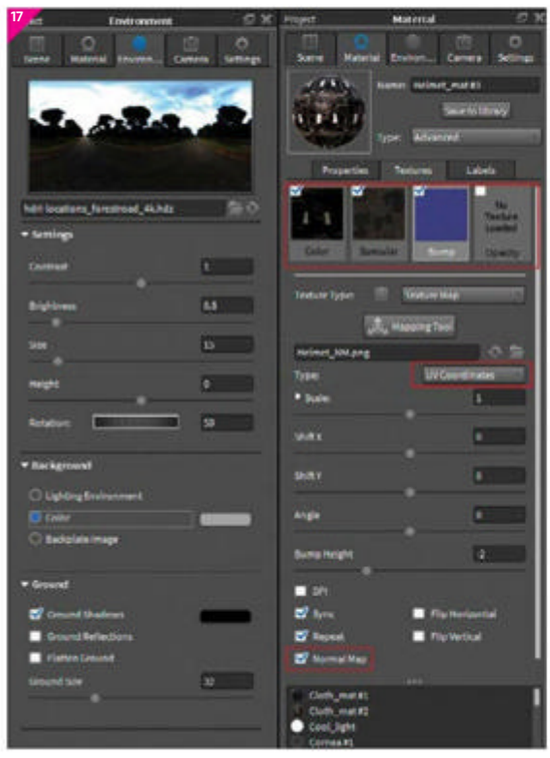


15 Texture in Substance Painter After you have created all the necessary maps for Substance Painter, go to File>New, select your mesh and all the maps you need and click OK. Check if your maps are imported correctly. You can check this under the TextureSet Settings, where you can also choose the tool to input material manually. When all the materials are in their correct slot for all the texture sets, you can start texturing. Start by adding a fill layer already filled with material. This fills your whole model, and you don't want that so right-click on your fill layer and choose 'Add Mask with color selection'. This brings up your Colour ID map. To add effects like dust and scratches, add a new layer and paint them in using either the particles and/or the normal brushes. This way you can build up intricate and believable textures.

16 Pose your character For this project we posed the dark knight in ZBrush using Transpose Master. This is a relatively easy way to pose your model using a masking and transpose tool. However, it can be very tedious and time-consuming. Under ZPlugin you can find Transpose Master, click the big TPoseMesh button. ZBrush will then go through all your subtools, take it to the lowest subdivision and merge everything together in a new tool. We like to use 'Mask By Polygroup' which you can find under Brush>Auto Masking. Move the slider to 100 and your brush will only affect one polygroup. We recommend you to have it on the side, that way you can turn it on and off quickly.

Scale mail with NanoMesh

A secondary way of creating the scale mail is to use the new feature NanoMesh. The important thing is to have the scale quite low poly as we are going to duplicate it all over the model. Convert the scale to create an InsertMesh brush, choose New in the pop-up window, then create a NanoMesh brush from that. You can find these options under Brush or by simply pressing B and they will be located near the bottom. Hover your mouse over a polygon and drag out the scale. This will drag out one instance of your scale, but by holding down Shift, it will populate all the same polygroups as the one you dragged initially. Under NanoMesh>tool, you have the option to change scale, rotation, offsets, colour and material and different alignments. Most of the sliders also have the options for variations.



17 Render in KeyShot With the new ZBrush to KeyShot Bridge, you can easily send your model over to KeyShot without any hassle. You can activate this by going to Render>External Render and finally pressing the BPR render button. By assigning the textures to your subtools in ZBrush, the Bridge will send them over to KeyShot as well. Then, when you're inside KeyShot, you can import your Specular and Normal map to each material. Just make sure that you turn on Normal in the Bump channel. As for the mapping, remember to choose UV Coordinates. Here we have used an HDRI map to light the scene and for the reflections – this way you can change your lighting mood by just changing the HDRI map.

Our experts

The best artists from around the world reveal specific CG techniques

Maya
Jahirul Amin
jahirulamin.com

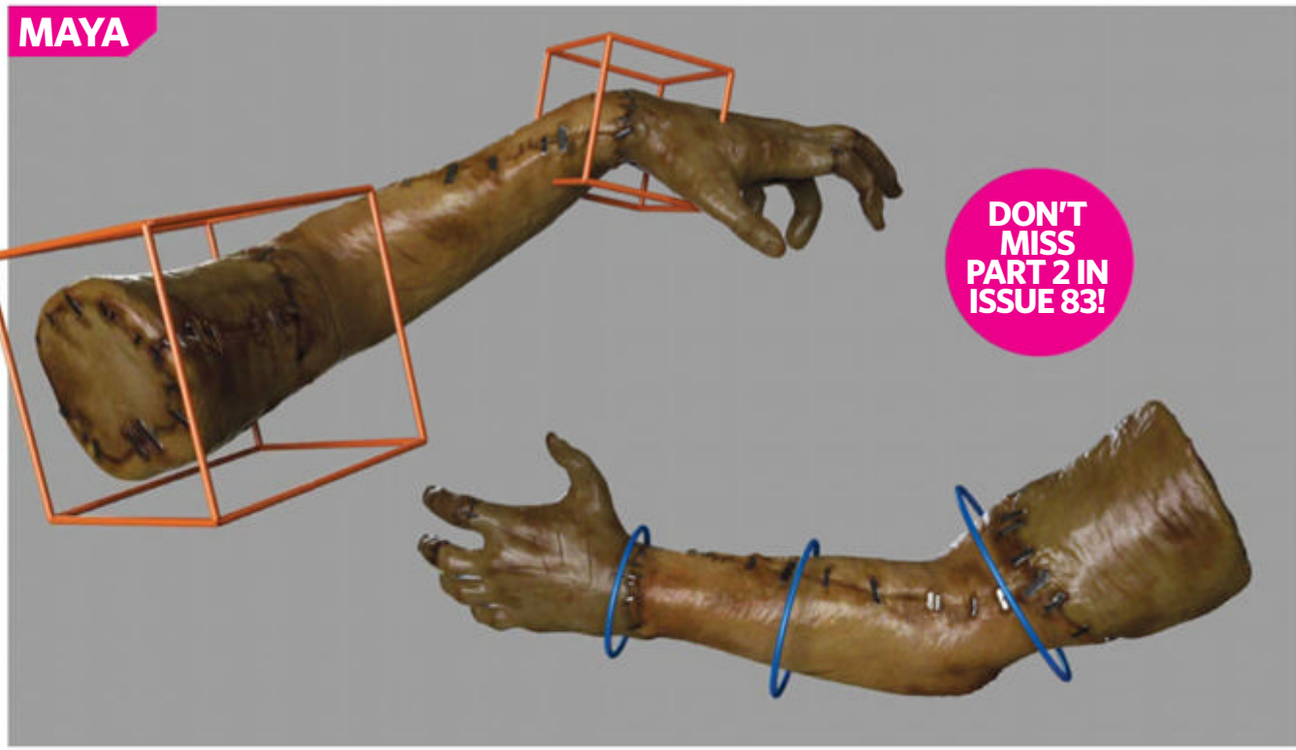
Jahirul Amin is a 3D trainer at Double Negative and has a passion for rigging and animation

Houdini, Mantra
Niels Prayer
nielsprayer.com

Supamonks Studio's FX supervisor, Niels, has also previously worked at Illumination Mac Guff

Maya
Thiago Vidotto
tvidotto.com

Thiago Vidotto is a Brazilian self-taught generalist working as a freelancer for videogame art

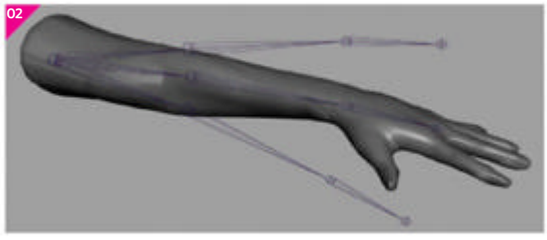


Rigging with FK and IK

In this tutorial, we will look at an efficient technique of rigging an arm that enables both FK and IK movement. A common way of handling such a task would be to create three joint chains: an FK, an IK and a bind chain (this is the chain that is used to deform the model), and then constrain the bind chain to both FK and the IK chain. From here you would then use Set Driven Keys to control the weighting attribute of the constraints, enabling you to control which chain (the FK or the IK) should drive the bind chain. Now there is nothing wrong with this method but in this tutorial we'll do something slightly different in that rather than using constraints, we'll use blendColor nodes. The advantages of this method is that it can reduce set-up times, and in more complex setups it can also provide a speedier rig.

For this tutorial, we've included a model of an arm, so feel free to use that or work on your own model. Before you start rigging, however, do examine the model. Make sure the Translate and Rotate values are at 0, and the Scale values are at 1. You should also delete any history off the model by going to Edit> Delete By Type>History. After that, you should be good to go. We're using Maya 2016 here, so if you are using Maya 2015 or 2014, you'll find that some of the buttons may be in a slightly different place. The concepts should still work though, so no quarrels there. Next issue, we'll look at how to use Set Driven Key to rig the fingers.

01 Create the arm joints Open up scene file 00_start. First create the arm joint chain. In the top view, go to Skeleton>Joint Tool and draw a four-joint chain by clicking first at the root of the arm, then at the elbow, next at the wrist and finally at the end of the palm. Add a slight bend to the arm as this makes it easier for the IK solver to figure out how the joint chain should articulate. Now from root to tip, rename the joints like so: 'upperArm_jnt', 'lowerArm_jnt', 'wrist_jnt' and 'wristEnd_jnt'. Check the joints from all angles and examine their placement. The Perspective view will be ideal for this. We ended up translating upperArm_jnt so that the arm chain sat in the middle and rotated the joints and used the Translate X attribute on all the children joints to get them into place. Once you are happy with the joint placement, select upperArm_jnt and go to Modify>Freeze Transformation. This will clean out all the values in the Rotate channels for all the joints. Next, we want to have the flexion of the arm driven by positive Z rotation so select upperArm_jnt and go to Skeleton>Orient Joint. When the dialog box pops up, set the Primary Axis to X, the Secondary Axis to Y and the Secondary Axis World Orientation to Z (+). Check the rotations of the joints to see if you are happy with the results.

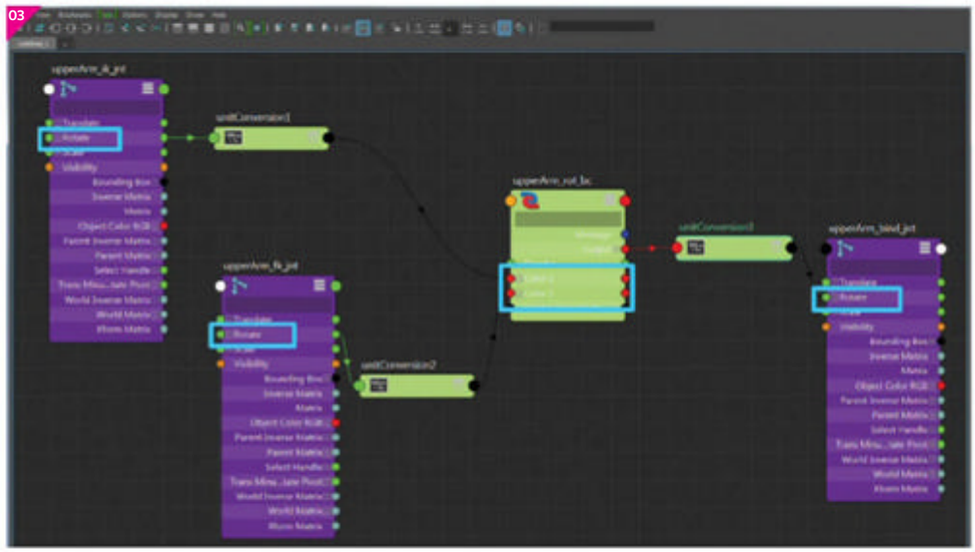


YOUR FREE DOWNLOADS
from **filesilo.co.uk/3dartist**
- Tutorial screenshots
- Project files
- Video tutorial

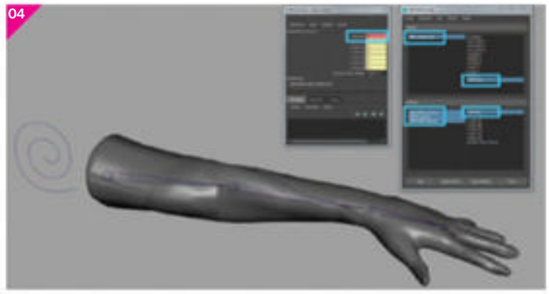
02 The FK and IK joint chains We'll now create the FK and the IK joint chains. Select upperArm_jnt and hit Cmd/Ctrl+D to duplicate it. Then with the upperArm_jnt1 (the duplicate chain) selected, go to Modify>Search and Replace Names. In the Search for field, type _jnt and then in the Replace with field, type _fk_jnt. Then delete the one that is on the end of upperArm_fk_jnt. Next, duplicate upperArm_jnt again, only this time, rename the joint chain to end with '_ik_jnt'. Lastly, select upperArm_jnt and use the Search and Replace tool to change the name of the joint chain from _jnt to _bind_jnt. By updating the name of this joint chain, we can easily distinguish the joints that will be used for skinning from those that will not. The additional joints chains we have now (the FK and the IK set) should be sitting in exactly the same position as the original joint chain. The next thing we did was to create some low-res geometry and parent it to the arm. This is so that we could test out how the arm articulates without having to work on skinning the model. You can do this by duplicating the existing arm, reducing the poly count, chopping up the reduced mesh using the Extract tool and then parenting this geometry to the relevant bind joint. Rotating the bind joints should now drive the low-res arm.

03 Drive the bind joint chain We will now drive the bind joint chain using blendColor nodes. In the Outliner, start by selecting upperArm_bind_jnt, upperArm_fk_jnt and upperArm_ik_jnt, and go to Windows>Node Editor. Next, and still in the Node Editor, hit the Tab key on the keyboard and type 'blendcolors', and then hit Enter to create the node. Double-click the blendColors node now to open it in the Attribute Editor then rename it to 'upperArm_rot_bc'. The 'rot' is for rotation and the 'bc' for blendColors. In the Attribute Editor for the node, you will also notice a Blender attribute. This is what we will use later on to drive the switch between FK and IK. Now, in the Node Editor, click on the top-right corner icon for all the joints and upperArm_rot_bc to reveal all the attributes. Next, drag the Rotate output from upperArm_ik_jnt and drop it into Color1 on the upperArm_rot_bc node. Then grab the Rotate output of upperArm_fk_jnt and drop that into the Color2 slot on the upperArm__rot_bc node. Lastly, take the Output of upperArm_rot_bc and drop it into the Rotate input for upperArm_bid_jnt. As we connect the rotate attributes into and out of the blendColors node, you'll notice unitConversion nodes are created. This is all fine so leave them as they are. With all that done. Repeat the process for the lowerArm joint and the wrist joint. For each joint, you will need to create its own blendColor node.

03



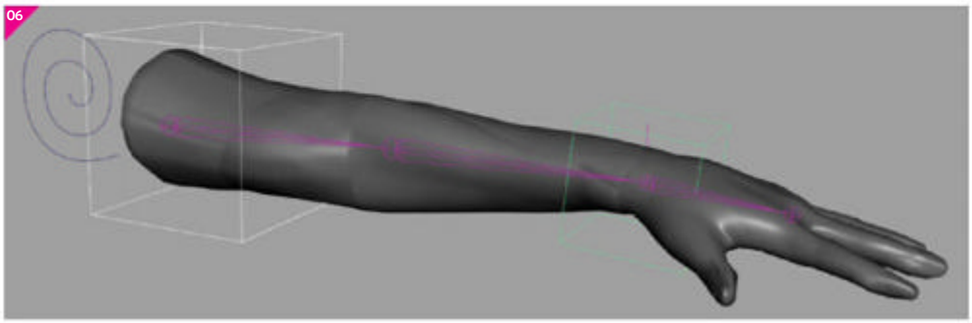
04

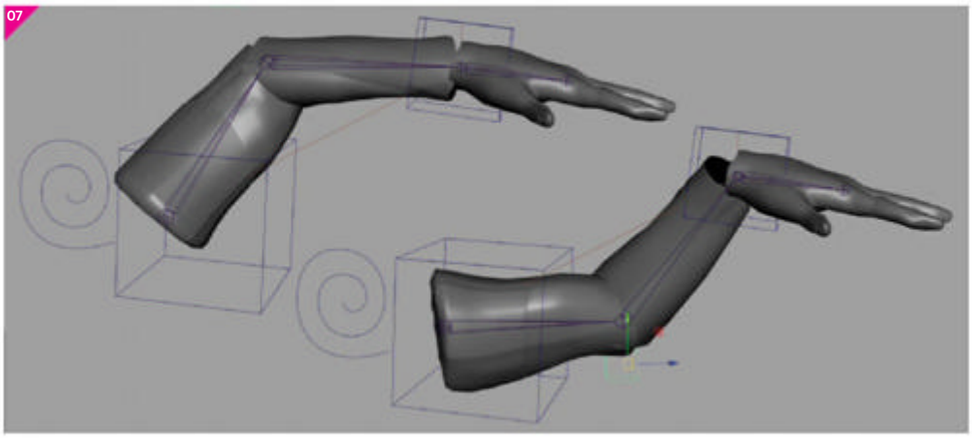


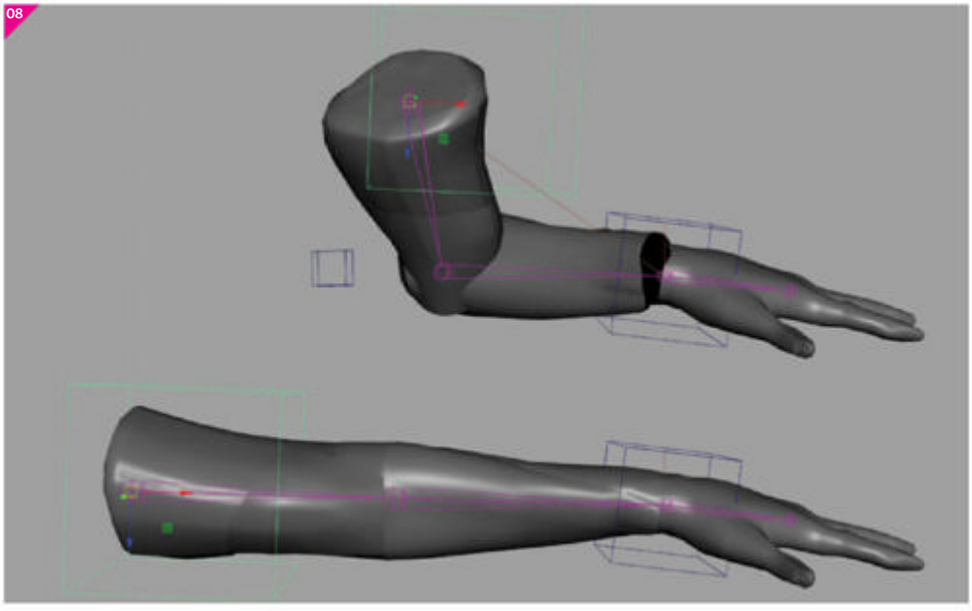
05

04 Blend between FK and IK Now that we are at this stage, we'll need a control with an attribute that will let us switch between the FK and IK. For this control, simply use the CV Curve Tool to create a swirl shape. Then position the control close to the upper arm and go to Modify>Freeze Transformations and Modify>Center Pivot. Next, rename the new curve to fkIk_switch_ctrl. Now, with the control selected go to Modify>Add Attribute. When the window pops up, give it the following name: 'arm_fkIk'. Set the Data Type to Float. Set the Minimum to 0 (this will be FK mode), the Maximum to 1 (this will be IK mode) and the Default at 0. Hit OK when you have filled in all the fields and you should see this new attribute in the Channel Box. Now we'll use Set Driven Keys (SDK) to drive the blend between FK and IK. First, go to Windows>Rendering Editors>Hypershade and jump to the Utilities tab. From here, select the three blendColor nodes that you should have created and then with the Animation menu active, go to Keys>Set Driven Key>Key. This should load the three blendColor nodes and drop them into the Driven section of the SDK window. Now select fkIk_swtich_ctrl and hit the Load Driver button. Next, set the arm_fkIk attribute to 0 and then set the Blender attributes on all three blendColor nodes to 0. Back in the SDK window, hit the Key button. Following that, set the arm_fkIk attribute to 1, the Blender attributes to 1 and hit Key once more on the SDK window. If you rotate the FK and IK arm joints around now, you should see that they drive the bind chain and you can switch between the two modes.

05 Create the FK controls Let's create the controls for the FK joint chain. Start with a NURBS circle in Create>NURBS Primitive and rename it 'upperArm_fk_ctrl'. With this still selected, hit Cmd/Ctrl+G to create two group nodes that will live above it in its hierarchy. Rename the group nodes from top-down 'upperArm_fk_ctrl_offset' and 'upperArm_fk_ctrl_sdk'. The _offset group will be used to place the control correctly and the _sdk group can be used for more control. Next select upperArm_fk_ctrl_offset and parent it under upperArm_fk_jnt. You will see some values pop into the Channel Box for the _offset group. From here, zero out all the values for the Translate and the Rotate channels (not Scale). The control should now pop to the correct place. Unparent the _offset group to bring it out of the joint chain hierarchy. To edit the shape of the control, jump into component mode and use the CVs. Scale the CVs up and move them down the arm slightly. Now, select in this order: upperArm_fk_ctrl, upperArm_fk_jnt and go to Constrain>Orient. Repeat the process for lowerArm_fk_jnt and wrist_fk_jnt. You should now have three FK controls. Next, parent one control under the other so that we can create a forward kinematics behaviour. Do this by parenting wrist_fk_ctrl_offset under lowerArm_fk_ctrl, and then parent lowerArm_fk_ctrl_offset under upperArm_fk_ctrl. The FK controls should now be working and driving the FK joint chain. Rotate the controls to test them out. Once you are satisfied, zero out the rotations to return the arm to its default position.







06 Create the IK controls Before we move on to the IK controls, add an IK handle. To do so, switch to the Rigging menu (Animation menu if you are in Maya 2015/14) and go to Skeleton>IK Handle Tool (Options) and set the Current solver to Rotate-Plane Solver. With the tool active now, click on upperArm_ik_jnt and then on wrist_ik_jnt. Now select the newly created IK handle and rename it arm_ik. Also, look for the effector node (living underlowerArm_ik_jnt) and rename it 'arm_ik_effector'. Next, we need to create a control for the IK handle. You can use any NURBS curve you want. Take the new curve shape, rename it 'arm_ik_ctrl', and then with the control selected, hit Cmd/Ctrl+G twice. Rename the top group in the hierarchy 'arm_ik_ctrl_offset' and the group below 'arm_ik_ctrl_sdk'. To position the control (as our IK handle is just translated in World mode), select arm_ik_ctrl_offset, hold down the V key and then snap the position of our _offset group to the IK handle. We now want the orientation of the control to match the orientation of the wrist joint. To achieve this, select wrist_ik_jnt, Shift+select arm_ik_ctrl_offset and go to Constrain>Orient (in the Options make sure Maintain Position is disabled). Now search for the orient node in the Outliner (under arm_ik_ctrl_offset) and delete it. Next duplicate arm_ik_ctrl_offset, and rename the two groups and the ctrl 'arm_root_ik_ctrl'. Select the _offset node for this new control, parent it under upperArm_ik_jnt, zero out the Translate and Rotate values and then unparent it. You should now have two controls in place for the IK arm: one at the root and one at the wrist. If you need to reshape the controls, make sure you do so in component mode.

07 Create the IK elbow control Set the arm to be driven by the IK joints (using our custom attribute) so we can see how it behaves. Then select in this order: arm_ik_ctrl, arm_ik, and then go to Constrain>Point. Then select in this order: arm_ik_ctrl, wrist_ik_jnt, and go to Constrain>Orient. Lastly, select in this order: arm_root_ik_ctrl, upperArm_ik_jnt and go to Constrain>Point. Our controls should now drive the arm. You'll notice that the root control does not carry the bind joints – we'll fix this later. Now for the IK elbow control select arm_root_ik_ctrl_offset and hit Cmd/Ctrl+D to duplicate it. Then use the Search and Replace tool to rename it from '_arm_root_ik' to '_elbow_ik', and delete the one that will be hanging on the end of the offset group. To position the new control, select in this order: upperArm_ik_jnt, lowerArm_ik_jnt, wrist_ik_jnt, elbow_ik_ctrl_offset and go to Constrain>Point. Next, select in this order: lowerArm_ik_jnt, elbow_ik_ctrl_offset and go to Constrain>Aim. Look under elbow_ik_ctrl_offset now and delete the two constraint nodes we just created. Now select elbow_ik_ctrl_offset and translate the control slightly away from the arm using the x axis (make sure to do this in Local mode). Then select in this order: elbow_ik_ctrl, arm_ik and go Constrain>Pole Vector. The new control now orients the elbow. You can also add a custom attribute on arm_ik_ctrl to drive the Twist value on the arm_ik. for a second method of twisting the arm.

08 Translate the root We now want to drive the position of upperArm_bind_jnt with its FK and IK counterparts. Bring upperArm_bind_jnt, upperArm_fk_jnt and upperArm_ik_jnt into the Node Editor. Create a new blendColors node and rename it 'upperArm_trans_bc'. Plug the Translate output from upperArm_ik_jnt into the Color1 input on upperArm_trans_bc and then the Translate output of upperArm_fk_jnt into the Color2 input. Feed the output of upperArm_trans_bc into the Translate of upperArm_bind_jnt. Use SDKs to drive the blender attribute on upperArm_trans_bc to enable the switch between FK and IK modes. The driving attribute should still be arm_fkIk. The bind arm should follow the IK arm. To have it follow FK, select in this order: upperArm_fk_ctrl, upperArm_fk_jnt and go to Constrain>Point.

09 Control colour and visibility

Time for some rigging housework. First we'll start with visibility so hide the FK controls when we are in IK mode and hide the IK controls when we are in FK mode. Start by selecting all three IK controls and upperArm_fk_ctrl. Then go to Key>Set Driven Key>Set to bring them as driven objects into the SDK window. Select fkIk_switch_ctrl now and hit the Load Driver button. Also set the arm_fkIk attribute to 0. Select all three IK controls now and set the Visibility attribute to 0. Back in the SDK window, highlight arm_fkIk in the top-right box, all four objects in the bottom-left box, the Visibility attribute in the bottom-right box and hit Key on the SDK window. Then set the arm_fkIk attribute to 1, enable the Visibility to all the IK controls, disable the Visibility on upperArm_fk_ctrl and hit Key once more. The next step is to colour the controls. To do this, select them one at a time and in the Attribute Editor, scroll down to the Display>Drawing Overrides section. From here, check the Enable Overrides option and then pick a colour using the Slider below or set the mode to RGB (2016 only) to select any colour of your choice. The next thing you could do is create some geometry for the IK and the FK arm chains (just duplicate the original lowRes geo) and then parent it under the relevant joint chain. You can also add shaders to each set of geometry (we just added Blinn shaders) so you can quickly distinguish between the two modes. Another thing we did was to add two custom attributes to the fkIk_switch_ctrl that would let us show and hide the visibility for the FK and IK arm geometry.

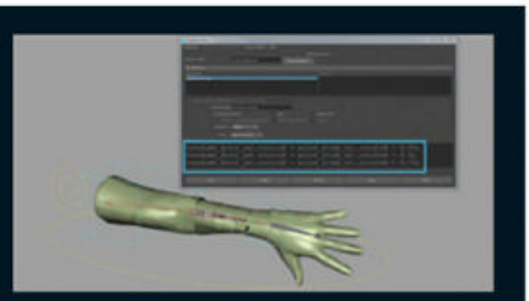
10 Global SRT and cleaning up

Let's create a control that will carry the entire rig. Start with a NURBS circle and rename it 'arm_global_SRT'. With the control selected, hit Cmd/Ctrl+G twice and rename the group 'nodes _offset and _sdk'. Next, select the CVs of the curve and scale them up so the control surrounds the entire arm. It's time for some cleaning up now. Take arm_root_ik_ctrl_offset, arm_ik_ctrl_offset, elbow_ik_ctrl_offset and hit Cmd/Ctrl+G. Rename this group 'arm_ik_ctrl_grp'. Next take arm_ik and upperArm_ik_jnt and group them together. Rename this group 'to_ik_rig_grp'. Then take upperArm_fk_jnt and hit Cmd/Ctrl+G. Rename this group: 'arm_fk_jnt_grp'. Next take upperArm_fk_ctrl_offset, hit Cmd/Ctrl+G and call this group 'arm_fk_ctrl_grp'. Then, take upperArm_bind_jnt and hit Cmd/Ctrl+G. Rename this group 'arm_bind_jnt_grp'. You should now have five new groups. Select all of them, along with

fkIk_swith_ctrl and parent them under arm_global_SRT. Lastly, select arm_geo_grp and arm_global_SRT_offset, hit Cmd/Ctrl+G to group them together and then rename that group 'char_arm'.

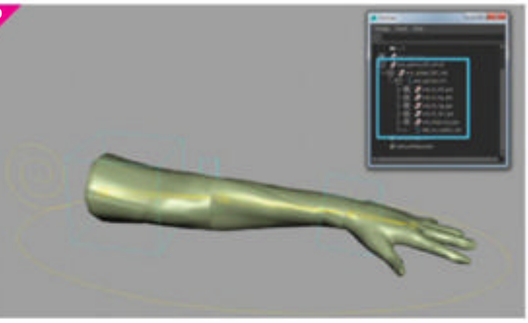
11 Finalise the arm rig

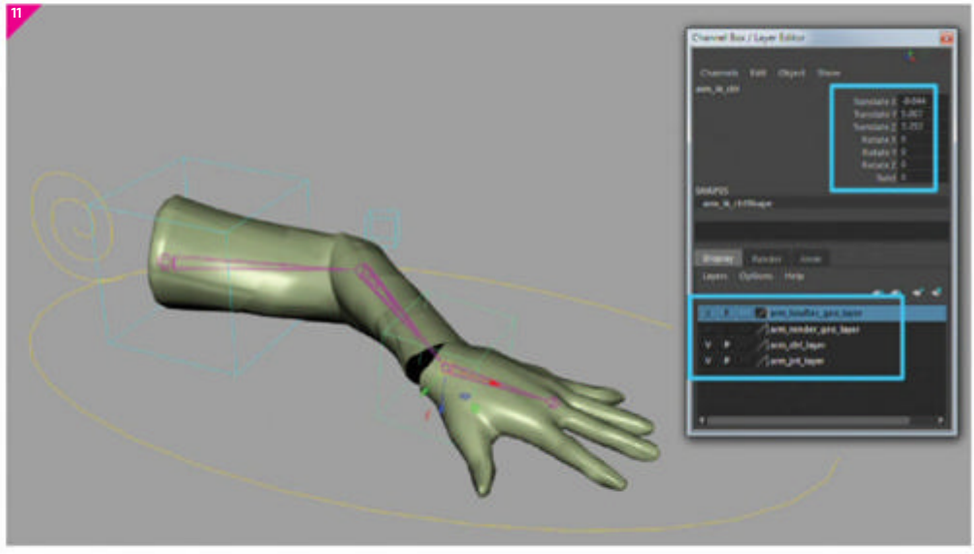
We now want to lock and hide certain attributes on the controls that we do not want the animators to key. Select fkIk_switch_ctrl and in the Channel Box highlight all the Translate, Rotate, Scale and the Visibility attributes, and then click the RMB and go to Lock and Hide Selected. For the IK elbow and root control, lock and hide the Rotate, Scale and Visibility attributes. For the IK wrist control, lock and hide the Scale and the Visibility attributes. For upperArm_fk_ctrl, lock the Scale and the Visibility attributes. And for the remaining FK controls, lock and hide the Translate, the Scale and the Visibility attributes. Then go in and find arm_ik, hit Cmd/Ctrl+H to hide it and then lock its visibility. Next, create some Display Layers to let you quickly show and hide the joints, the controls and the geometry. At this stage, you should now have an arm rig that lets you animate in either FK or IK mode. Next time, we'll work on rigging the fingers. Happy rigging.



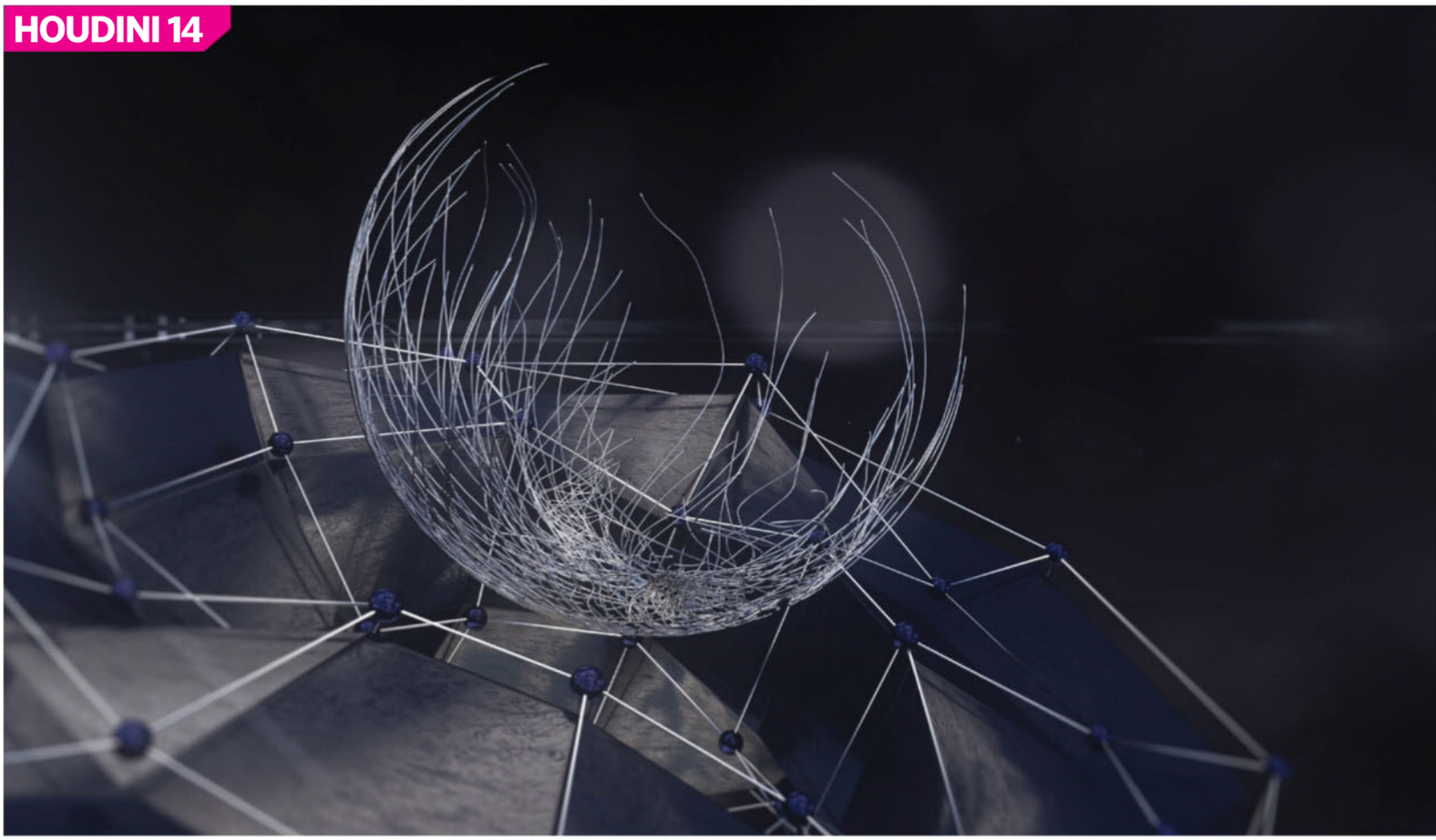
Adding forearm twisting

With the arm ready to go, why not add a few extra joints to the forearm, which would provide better deformation when twisting. Here is a quick overview of how we approached it for this tutorial; the accompanying video on FileSilo goes into more detail so you can re-create it yourself. First, create some additional joints and evenly space them between the elbow and the wrist joints. Then you will need to parent all the additional joints under lowerArm_bind_jnt. After that, use an expression or some nodes to drive the Rotate X of the additional joints using the Rotate X value of wrist_bind_jnt. Make sure that the joints closer to the wrist have more influence from wrist_bind_jnt, as that will help create a more natural falloff.





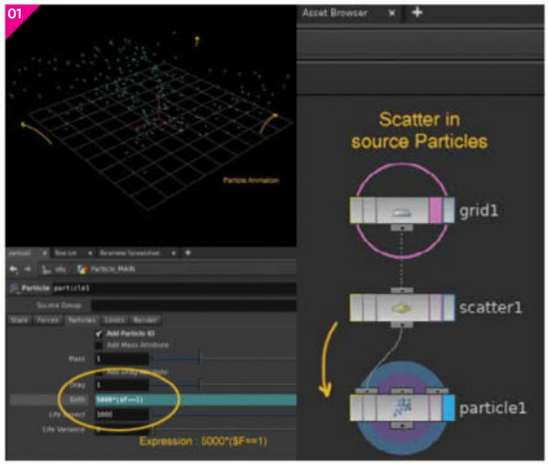
HOUDINI 14



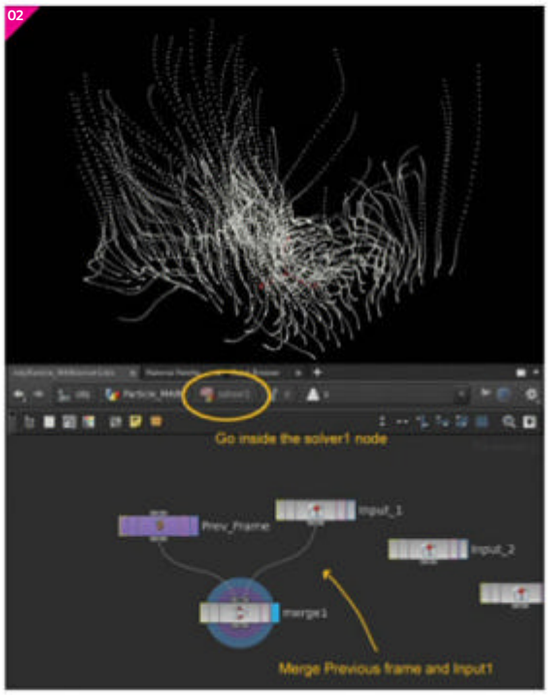
Master a particle effects system

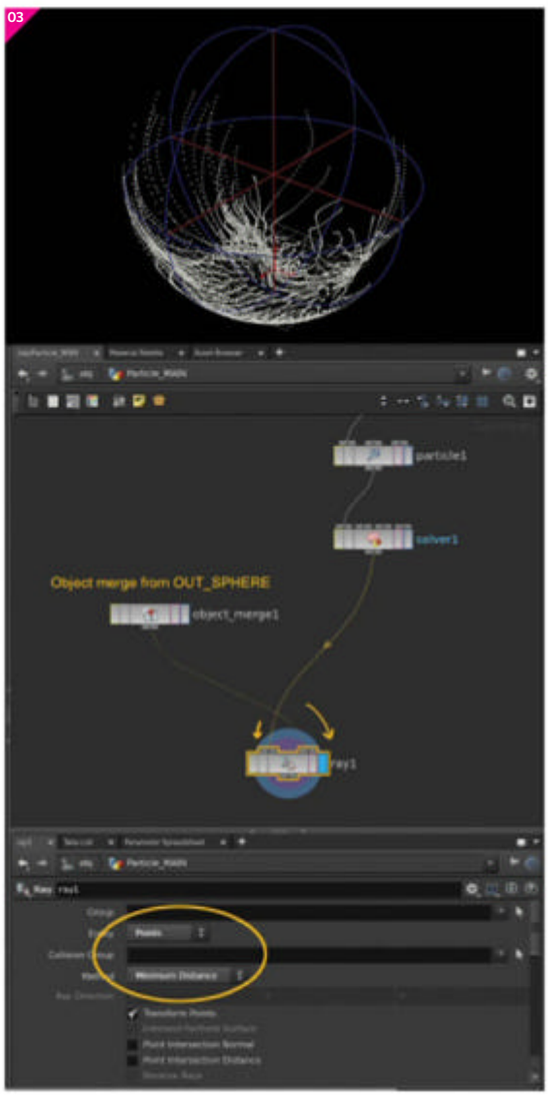
For this tutorial, we are going to create an epic motion design effect in Houdini and Mantra. This effect makes it appear as if a sphere is growing in a sci-fi style. The influence for this are the effects that can be seen on Faora-UI in *Man Of Steel*, in terms of movement and concept. From the technical aspect of this tutorial, you have to know the basics of Houdini (create nodes, working at different levels, UI and so on) but we will explain everything else needed for this effect. Our whole simulation will be based on particles and transforming in trails to create some nice curves that move really smoothly. We will learn how to create a particle system and particle trails, convert them into curves, make some manufactured objects with really sharp edges, convert edges in curves as well as how to attach geometry to points easily. We will also look at how to set up Mantra surface shaders and how to render them via the render engine. The really fun thing about this setup is the whole procedural system of Houdini: even if you have finished the work, you can easily modify the main simulation and everything else will be modified too. For motion design, especially when we have to do a lot of research during the process of fabrication, it's really important to stay procedural at each step; and that's what we have done for this tutorial. Beyond this tutorial though, you can develop your own setup based on the process used to make this effect to create a lot of cool growing things; the whole setup is customisable and reuseable ad infinitum.

01 Create main particles animation Create a geometry node called 'Particles_MAIN' and this will be our main simulation. Delete the file SOP and create a grid with 5 in x and y. Put down a scatter node with 250 points in Force Total Count. Create a particle node and put the scatter in the first slot. In the Particle1 node, in Forces panel, set Turbulence to 10 in x, y and z; Turb Period to 2. In Particles Panel, check Add Particle ID and put the following in Birth: '5000*($F==1)'. Now run the simulation for a smooth particle animation.



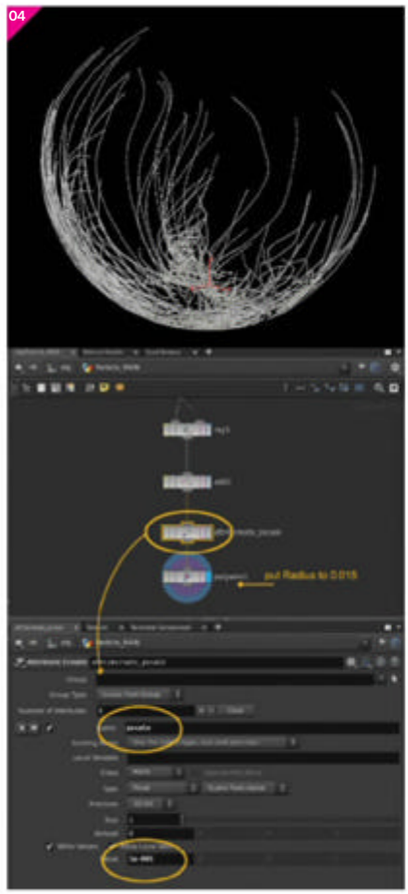
YOUR FREE DOWNLOADS
from **filesilo.co.uk/3dartist**
- Tutorial screenshots
- Maps
- Scene file





02 Bake particles animation with SOP Solver

Now, we have to create some nice trails for our simulation. To do that, we have to freeze the path of the particles in time. Create a solver node and plug the particle in. Dive inside the solver and create a merge node. Plug the Previous Frame slot and the Input_1 slot into the merge. Go back to SOP level. Now, if you go back to the first frame and run the sim, we have nice trails of particles growing with time with particles frozen along their own path.



03 Project with Ray SOP

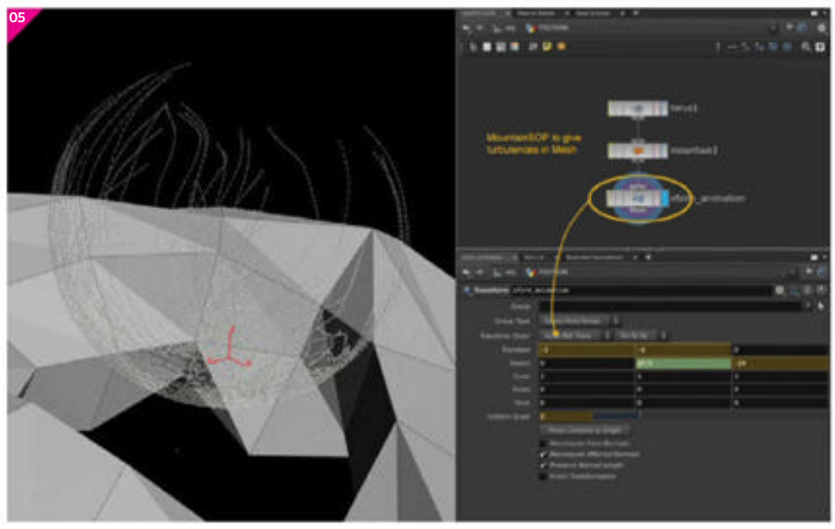
At the geometry level, create a new sphere node. Inside, put 5 for Radius. Now, with a transform, place the sphere around 3.9 in the y axis. After this, put a Null here and name it 'OUT_SPHERE'. Go back into our Particle_MAIN node and create an ObjectMerge. Then, in Object1 slot, grab your OUT_SPHERE from your previous sphere node. Create a Ray SOP and plug your ObjectMerge in the second slot and the Solver sim in the first one. In Ray, choose Points in Entity and Minimum Distance in Method. Run the simulation. You should now have your trails projected onto the sphere.

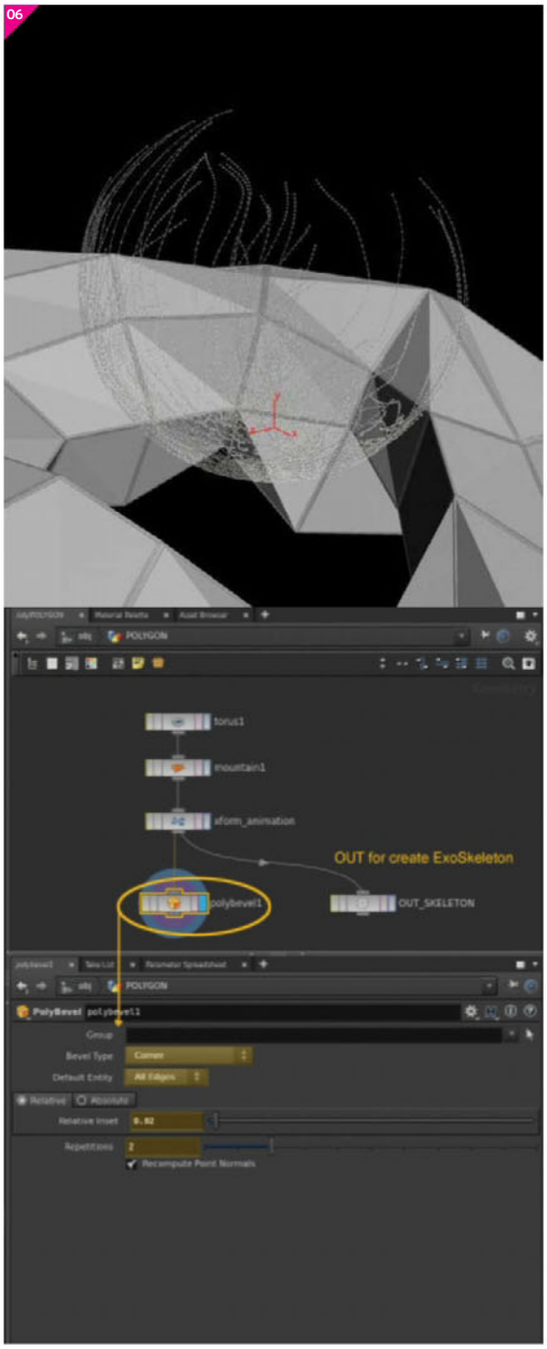
04 Convert in curves: Add SOP

Create an Add node and connect it to your Ray SOP. In the Polygons tab, check the Group panel and then set By Attribute for the Add method and 'id' for the Attribute Name. You should see your particles linked by curves. After this node, bring an AttributeCreate, set the Name to pscale and put a really low value here of around 0.00001. With that, only the curves will be visible at render time, not the points (the scale will be really small). Finally, put a Poly Wire after that, and set the Radius to 0.015. Now your curves are converted to polys and ready for rendering!

05 Create a background object

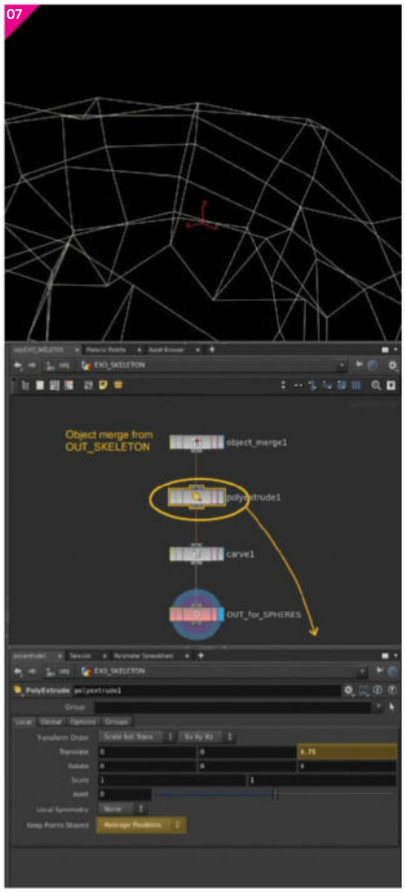
Now let's leave the sphere curves for a moment and work on something else. At object level, create a new Torus object. Set the Primitive Type to Polygons and Radius to 5 for x and 2 for y. This is where we will set eight rows by 11 columns. After that, add a Mountain node, and set the Roughness to 0.95 and the Height to 2. Now, with a Transform node, place your shape right under your previous sphere curve object, around -3 for x and -4 for y. Set the Uniform Scale to 2. Now you can put the expression $F/5 in Rotate Y for a nice slow movement to the shape.





06 Add details to polygonal object

Now we have to add details to this shape. To make nice flat faces, we need a PolyBevel right under our Transform. Set the Bevel Type to Corner and the Entity to All Edges. Stay in Relative mode and set the Relative Inset to 0.02 and the Repetitions to 2. Now, we have really sharp faces and nice bevels around each faces which give a really manufactured aspect to the object. Then, add a Null after the transform (next to the PolyBevel) and call it 'OUT_for_SKELETON'. We will use the unbevelled shape for the exoskeleton shape later. Now display the PolyBevel node.



07 Exoskeleton around the polygonal shape

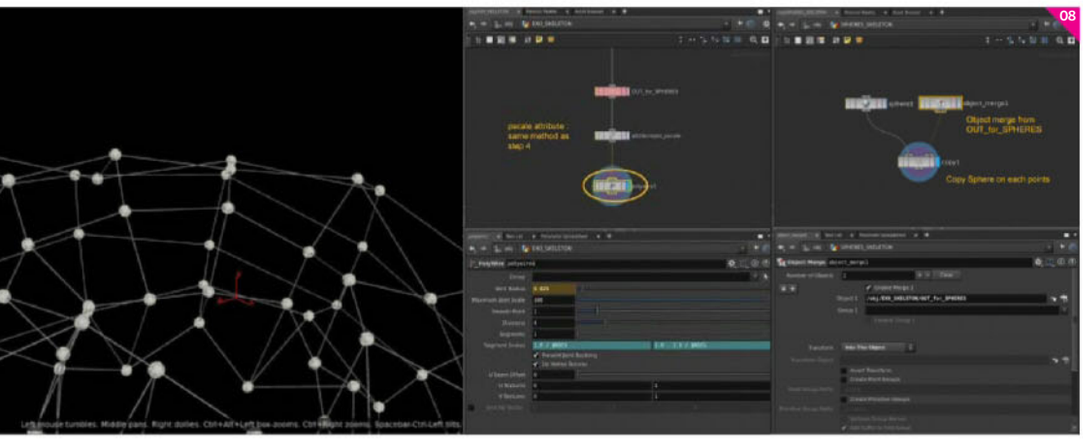
At the object level, create a new Geometry object. Call it 'EXO_SKELETON'. Inside, delete the file node and create an ObjectMerge. Find your previous OUT_SKELETON Null in Object1. Add a PolyExtrude to it and set the TranslateZ to 0.75. Set Keep Points Shared to Average Positions. After that, add a Carve SOP to keep only a contour of the shape. Put a Null right after the Carve and name it 'OUT_for_SPHERES'. We will use that later to put spheres on the points of the shapes.

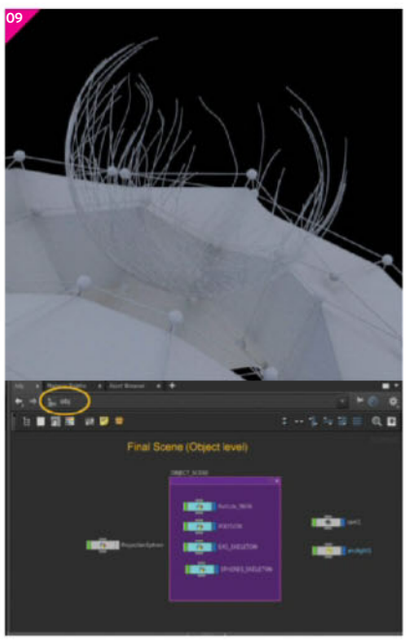
08 Detail refining on the skeleton

First, set an AttributeCreate SOP and in Name put 'pscale'. Then, put the Value at something like 0.0001 (in the same process as before), so that points are invisible at render time. Now, put down a Poly Wire node and set the Wire Radius to 0.025. Now, at the object level, create a new Geometry SOP with a ObjectMerge into it set to OUT_for_SPHERES. Next to it, add a Sphere with 0.25 for Radius. Put down a Copy SOP and plug the Sphere in slot 1 and the ObjectMerge in slot 2. Now our exoskeleton of tiny spheres is finished!

09 Set up lighting and camera

Now we have all our objects created. If you run the sim, you should see that the curves have created a sphere with your shape slightly turning under it on the y axis. We now need a camera for the scene. At the object level, create a Camera object and place it like the image below. After that, create an environment light. In the Light Panel set the Intensity to 2 and put an HDRI in the Environment Map. Now you should have your scene set and lit, prepared for shading and rendering.



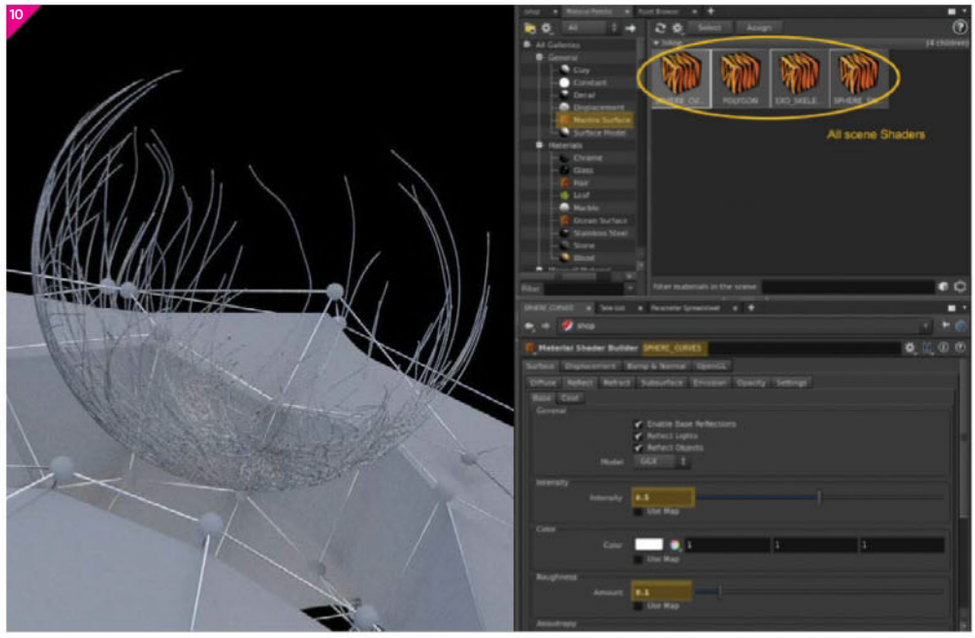


10 Shading with Mantra and rendering First, go to the toolbar and create a PBR render through Render>Create Render Node>Mantra-PBR. In the Material Palette, create four Mantra surface shaders. Now assign one shader to the Particle_ Main object, one to the POLYGON shape, one to the exoskeleton and finally, one to the SPHERES_SKELETON. Rename them properly. For the sphere curves, we need a chrome metal shader, so set the Diffuse intensity to 0 and the Base Reflection Intensity to 0.5. You can also apply the EXO_SKELETON settings onto the Mantra surface.

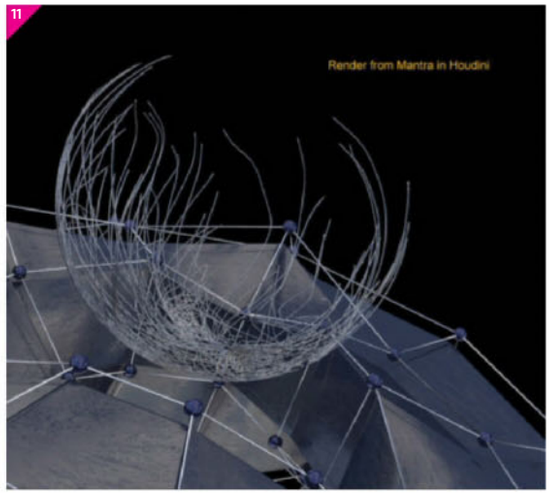
11 Further shading values Now we need to set up the other shaders. For the Polygon object, you can set the Diffuse intensity to 1 and the Base Color to a dark purple. In the Base Reflection, leave the Intensity at 0.1 and set the Roughness to 1. Check Use Map and put your Roughness map in the slot to make a nice-looking specular. Now, for the SPHERE_SKELETON one, set the Diffuse Intensity to 0.1 and give it a dark blue colour. Then in the Base Reflection, set the Intensity to 0.5 with a grey-blue colour.

12 Set the render and export In the Network view, go to the out panel and click on Mantra1 node. Set the frame range to 1-150. In the Images Panel set your output path to your output directory and set the Camera to cam1 (yourFolder/name.$F4.exr). Just below, in the Extra Image planes, check Shading Depth Pz so that we have a Z-Depth pass in our EXR. Now, in the Rendering panel, set Pixel Samples to 7 by 7. Finally, go to the top of the menu and hit Render. You should have an EXR with Color, Alpha and Z-Depth for comp.

10



11

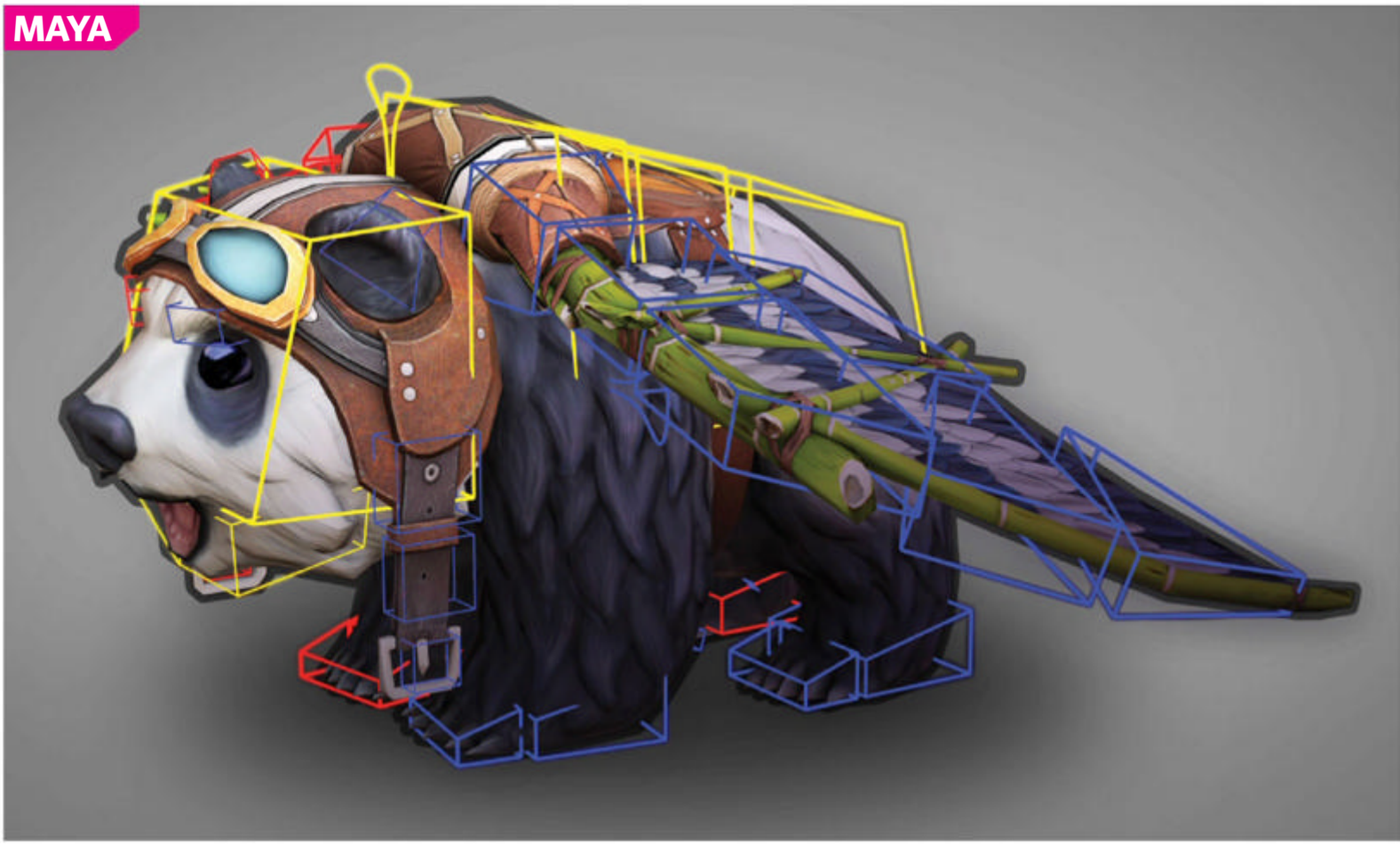


Compositing tips

You could create a really nice image with your three passes. You can increase contrast to give more impact to the image for instance. Then, you can add a little glow on the highlights to give a bloom effect to the scene, and with the Z-Depth map, you could add a nice depth of field with nice bokehs using the frischluft plugin in After Effects for example. In the background, it's better to have something really blurred to give it a nice depth, but without a lot of information, so that we stay focused on the foreground effect.

12

MAYA



Build a quick rig for videogame characters

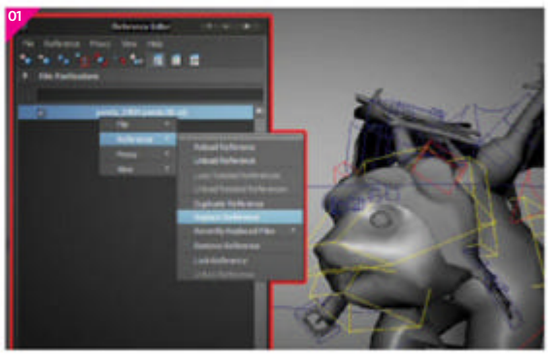
Not everyone enjoys doing rigs and it is understandable, but knowing how to do one will add much more value to the artist. It doesn't matter if he/she is a modeller or an animator, the rig can be part of both workflows and it can actually be quite fun too.

This tutorial will show how to make a working rig for characters in just one or two hours. It will focus on teaching a really quick technique that is going to work in multiple game environments; that being said this tutorial will not show you how to use thousands of controllers or complex scripts – it will show only what is necessary.

In the following steps, this tutorial will cover the creation of simple controller shapes, how to make them visible and how to use the bones as a shortcut to place them. It will also show a simple hierarchy workflow without worrying about the axis orientation, how to extract the orientation from the bones and how to mirror your controls in an effective way.

After following this tutorial, we hope it might change the negative mindset towards rigs and make it seem like a more pleasing process; with some training and knowing what is important to focus on, it is possible to transform days of work into something that can be done before your coffee gets cold.

01 Keeping it editable Keep the rigs as simple and editable as possible. We prefer spending more time on the animation, and because of this we can get back to the rig and change it. The first important thing to make this happen is to never animate directly on your rig file; always reference the rig inside the animation scene. This is so that every time we change the rig we only need to update the reference. Working like that enables the animation to be produced in parallel with the rig after an initial stage.



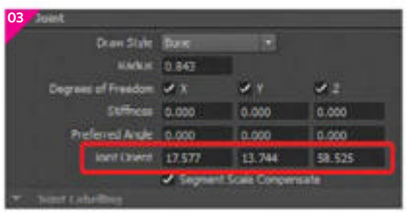
YOUR FREE DOWNLOADS
from **filesilo.co.uk/3dartist**
- Tutorial screenshots
- Maya files
- Tutorial videos

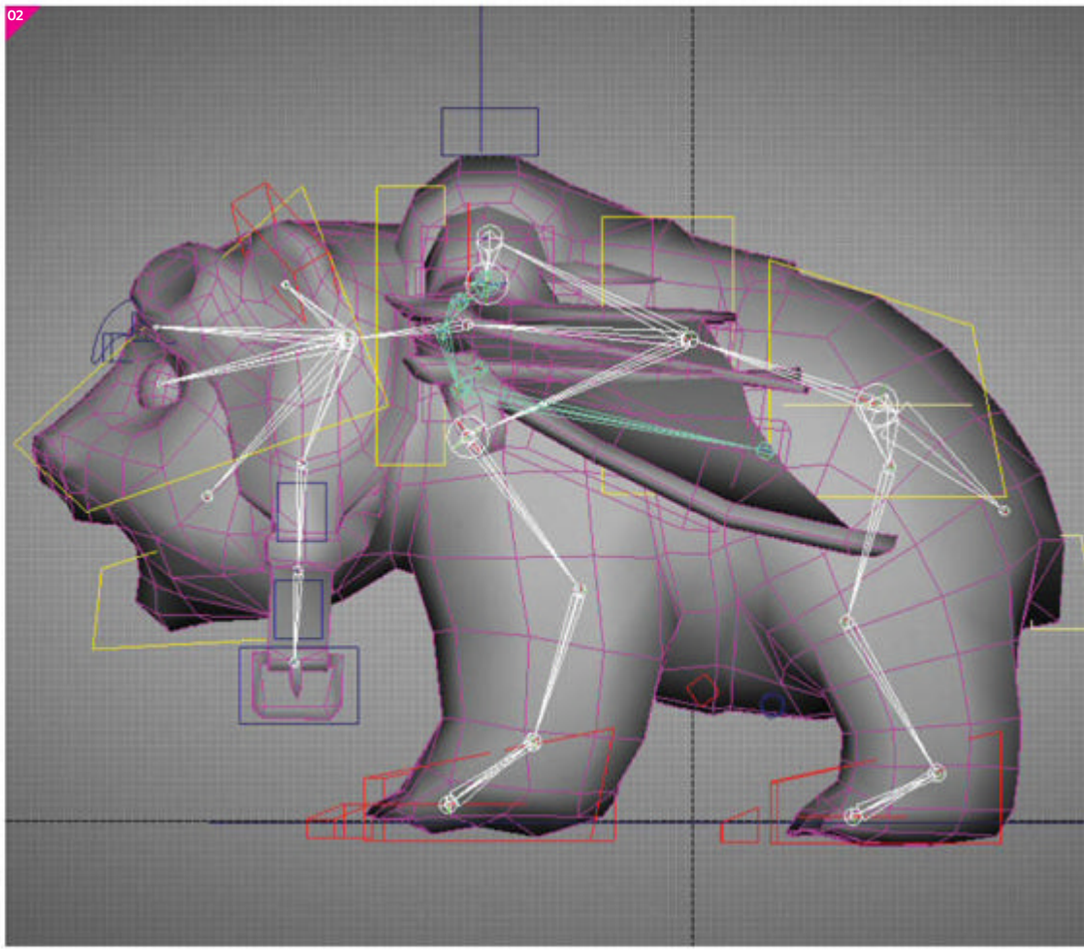
02 Bone placement It is really important how you place the bones as it can affect the entire rig and make the animation process a nightmare. A good rule to start is to follow the anatomy of a living animal that looks like your character. Of course most of the time it will need some interpretation, but referring to a real animal will make the final result more believable. Sometimes we need to be economic with the number of bones, so it is good to avoid finger bones or complicated wing structures. Try to think how important something is and how visible it is going to be.

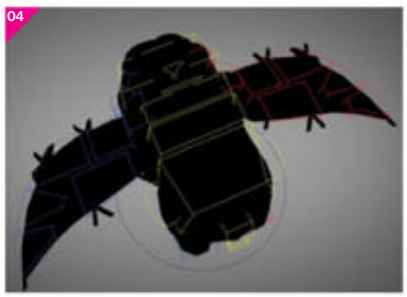
03 Bone orientation The orientation of your bones is also important for an easier animation process. Most of the main body bones usually follow one of the orthographic views, but some will require a special rotation angle – on this rig this was needed for the eyebrows and ears. To rotate them, make sure that you don't use the rotation tools; your bones should have zero rotation. They need to be oriented using the Joint Orient fields inside Joint Parameters in the Attribute Editor. Select the field you want to rotate and with the Cmd/Ctrl key pressed, use the middle-mouse button to modify the values.

04 Controllers Keep the controllers simple. The focus here is to be quick and to not waste time on fancy shapes – the rig needs to be easy to understand and easily manipulated. Work mostly with cubes made from curves and circles from the NURBS menu as they can be scaled and slightly changed to fit the shape of the body. You can use red and blue to identify the right and left sides of the controllers, yellow for the middle and a less saturated colour for secondary controllers.

05 Hierarchy of the controllers After creating all the shapes for the controllers, it is necessary to organise them in a hierarchy of movement. Usually this follows the bones' hierarchy and it can be done in multiple ways. The way we like to do it is to parent the controllers to the respective bone, zero the translations, and with the controller selected, create a group (Cmd/Ctrl+G). After unparenting the group from the bone, we will have the controller zeroed but following exactly our bone's orientation. Now stack groups inside the previous controller making the hierarchy chain alternate into groups and controllers.







How to make cube-shaped controllers

First, create a polygon cube, then open your script editor window and clean it. After that go to Create>CV Curve Tool and click on the option box. Then in Curve Degree select 1 Linear. Now, with the V key selected, click on each vertex of the cube. Don't worry about overlapping lines. When you're done, press Enter and your cube controller will be ready. To avoid having to make a new one every time, select the line created in the script editor and with the middle-mouse button drag it to the shelf, selecting MEL as the script type.

06 Breake the hierarchy As said before, the controllers usually follow the same hierarchy of the bones but a situation where this may not necessarily be the best option is on the head. When we are rigging the head we want the controller to follow the position of the neck but not the rotation. To do that, we need to place a locator parented to the neck controller and use it to define only the position of the head's group, instead of parenting it under the neck hierarchy. This will enable us to easily control its rotation and where the character is looking.

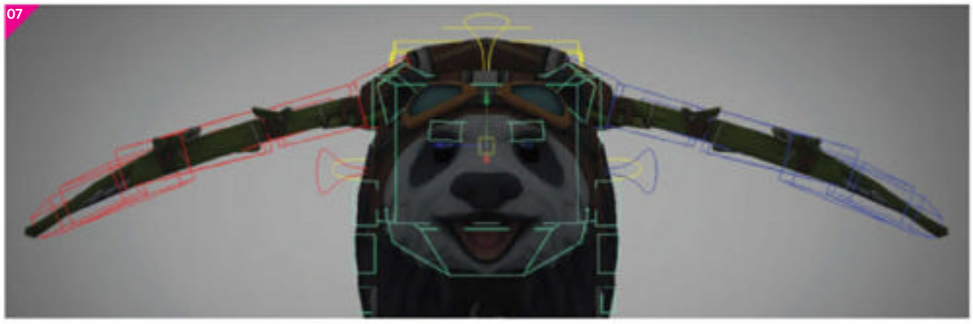
07 Mirroring Mirroring the controllers saves a lot of time but if not done right it may give you some extra problems during the animation process. A good mirrored controller will keep the same rotation and translation behaviour when keyed with the exact same values. However, if you create a controller on the opposite side of a character with the exact same method, you will not be able to copy the animation curves from one side to the other. To fix this you can parent all duplicated chains to an extra group with a negative value on the x scale.

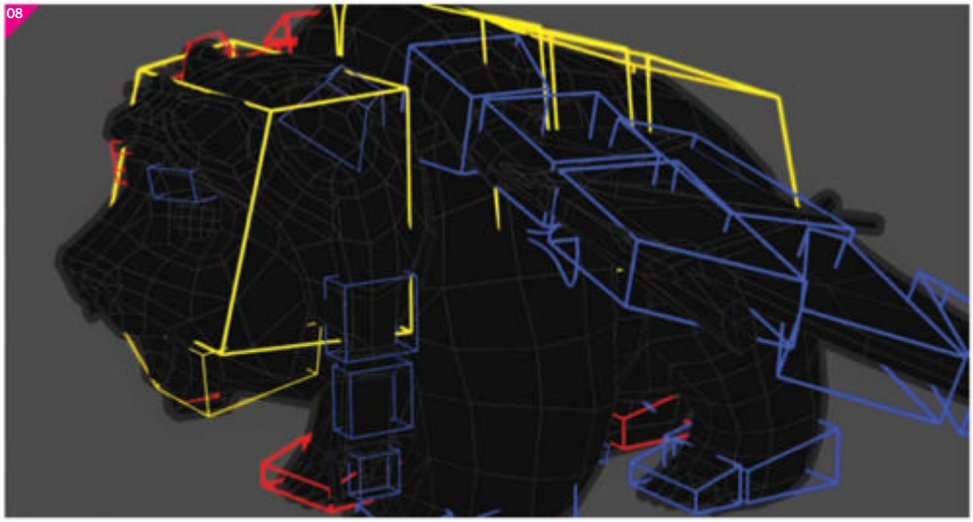
08 Finish the controllers Before constraining the bones to the controllers, it is good to make a test pass on all of them. It's not uncommon, when doing a repetitive process like organising the hierarchy chain, to forget a controller is unparented or that it has some rotation values. All controllers must have zero rotation and translation, but that is not true for the groups: they need to have the info from the bones made in Step 5. After this stage is done, almost all of the bones can be constrained with parent constrain, the ones using a mirrored controller should use a point and orient constrain.

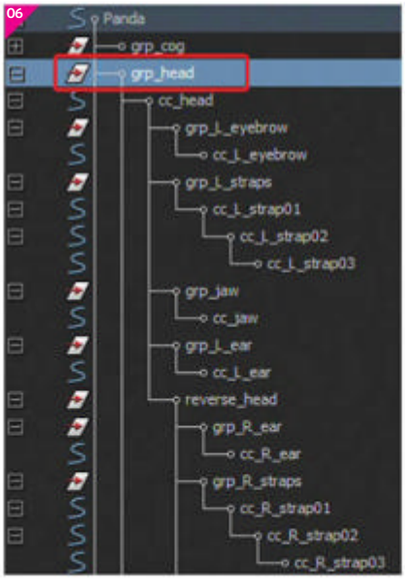
09 Intermediary skin Now do a quick skinning and don't aim to make it perfect before starting the animations. A low-poly model can be hard to skin sometimes, and you will only know if it's working when testing some animations. After doing a smooth bind on the mesh, save several animation poses on the timeline before tweaking the skin. Now start adding weight to the external parts of the rig, like the claws, then lock the influences and keep going higher on the hierarchy chain. It requires a lot of trial and error, so keep testing the poses often.

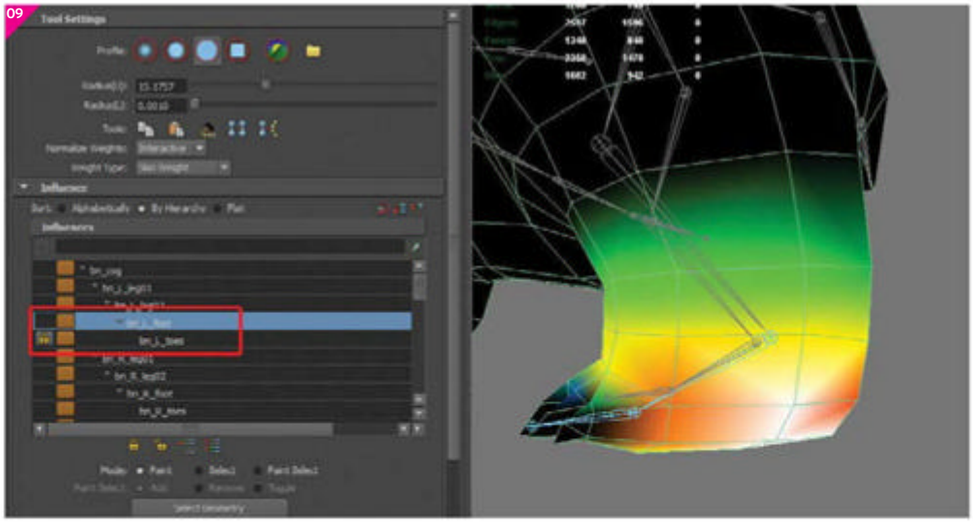
Colouring the controllers

Using colours on the controllers make them more recognisable (usually blue for left side and red for the right), which is really useful when you start animating with the texture. The use of saturated colours keeps their visibility even with the new visual distraction. Maya is not good at making the colouring task easy so the best way is by using a script called dpColorOverride created by Danilo 'Nilouco' Pinheiro (**nilouco.blogspot.ca**). It creates a small window, where you just click once on the colour you want and it will colour your controller.









All tutorial files can be downloaded from: **filesilo.co.uk/3dartist**

Technique focus

Incredible 3D artists take us behind their artwork

ANGER As well as emitting light using RenderMan's geometric area lights, the emotion characters were made up of particles. "[There isn't] a clear line as to where their skin begins and ends. It's like... particles moving within their form," says story supervisor Josh Cooley. "So when Anger gets really angry you can see particles moving around like crazy."

Fujitsu CELSIUS H730

With this mobile workstation, you're paying for quality design and a premium brand

The H730 is a 15.6-inch laptop that looks like it means business. Not just from the specification, with its Intel Core i7 processor and Quadro graphics card, but in the exceptionally premium feel to the design and appearance too.

Fujitsu has used a lovely silver-coloured metal casing and lid, subtly adorned with the company's signature red trim on both the case of the chassis and each of the island-style keys. It's a mobile workstation that looks like it's for grown-ups who do grown-up things, not for gaming or messing about on social media, but professional computing tasks that need high performance.

The design is fantastic. It's not especially thin but it does only weigh 2.75kg, which is not bad at all for a mobile workstation.

However under the hood, the graphics capability of this entry-level H730 variant doesn't quite match its high-end appearance or cost. It has an Nvidia Quadro K1100M, a graphics card that's quite weak compared with other mobile graphics monsters.

This card has 2GB of GDDR5 memory and 384 CUDA cores, although we'd recommend choosing the beefier K2100M, which has 50 per cent more cores, and is available as an upgrade.

It also has 8GB of memory and a 256GB Toshiba SSD, a relatively standard configuration, both of which can be similarly upgraded. In the case of the memory though, a bump to at least 16GB is definitely recommended if you plan on working on larger 3D projects.

IEEE 802.11ac wireless is built in and there's plenty of scope for expansion, with three USB 3.0 ports, a USB 2.0 port, VGA and DisplayPort video outputs. There's also an expansion bay for a larger battery, which is recommended if you do actually upgrade the graphics card.

The quad-core Intel Core i7-4800MQ processor is no slouch at all. Running at 2.4GHz as standard, it can jump up to 3.7GHz in Turbo Mode, and will ensure that any CPU-bound tasks run superbly. Although the chip can be upgraded to a 2.9GHz Core i7-4910MQ if you need it, which runs at 3.9 GHz in Turbo Mode.

Test results were a mixed bag though. In CINEBENCH, the H730's OpenGL score of 39.38 isn't that great and it also comes out slightly below Dell's ultrathin Precision M3800, which scored 42.14 (a laptop which had the same CPU and graphics card when we tested it).

SPECviewperf times weren't good at all, and this wasn't very surprising for us given that this test is very much driven by the performance of the graphics card. Although in this test the H730 just about beat the M3800.

However in 3ds Max, the processor-intensive 1080p test was completed in just over 21 minutes, beating both the M3800 and HP's ZBook 17.

And the battery life test result we measured is definitely worth a mention – five hours 50 minutes is a great achievement in PC Mark, a fairly gruelling test that can drain many mobile workstations in under two hours.

From our tests with a colorimeter, the screen is merely okay. We measured 84 per cent sRGB coverage and a low maximum brightness of 182.2 – this result is comparable to many other mobile workstations, but not earth-shattering.

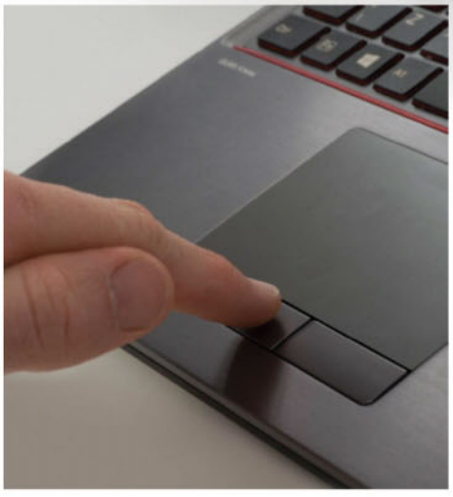
Despite our criticisms, there's still plenty to like about the H730. CPU performance is more important than graphics for some 3D software, and it offers plenty of processor juice. The quality of the design is second to none, and the battery life is really good. Just upgrade the graphics card when buying and you'll have a good mobile rendering workstation at hand.

Orestis Bastounis

> The Intel Core i7-4800MQ processor is no slouch at all. Running at 2.4GHz as standard, it jumps up to 3.7GHz in Turbo Mode

MAIN The TN screen looks fine, but it's not immediately striking like HP's colour-accurate DreamColor display

ABOVE Plenty of expansion is possible and could transform the H730 into a real rendering powerhouse

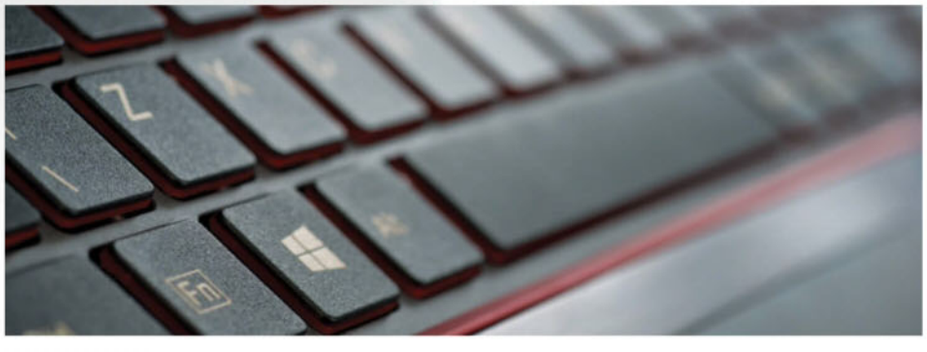


LEFT The solid build and striking design is most impressive, but the K1100M in this entry-level model brings overall scores down

BELOW Fujitsu has made clever use of red trim around the laptop

Essential info

Price	£1,705
Website	fujitsu.com/fts/products/computing/pc/workstations/celsius-h730/index.html
OS	Windows 7 or 8.1
CPU	Intel Core i7-4800MQ
SSD	Toshiba 256GB
GPU	Nvidia Quadro K1100M
RAM	8GB



Summary

- Features ★★★★☆
- Performance ★★★☆☆
- Design ★★★★★
- Value for money ★★☆☆☆

Verdict ★★★½☆

The H730 is every bit a beautiful laptop, but for anyone serious about 3D performance, upgrading to a Quadro K2100M will make a big difference

CadMouse

We test the CadMouse and see if the extra mouse and radial buttons make any difference

When it comes to mice, they're probably the last thing you'd want in the house. But, on the other hand, if all mice were like the CadMouse from 3Dconnexion, you might be happy to get rid of your traps.

Before the CadMouse, we'd been using the same old two-button mouse with a scroll wheel for four or five years. It had worked out fine and done the job at hand, or so we thought. How wrong we were.

Firstly, there's comfort. On first unravelling the CadMouse, we were taken aback by its size as it's around a third larger than a standard mouse. Once you get your hand on it, however, rather than feeling bulky, there is space for all your fingers to comfortably surround the mouse and move it around with precision and ease. It's a fine example of ergonomics working some magic.

So it feels great, but does it actually improve productivity? We think so. Having a true middle mouse button (in addition to the traditional scroll) feels very natural, which was especially apparent when navigating 3D space.

The CadMouse has been tested out in Maya, and another of its major advantages is being able to maximise the radial menu buttons and gestures. It takes little to no time to connect the radial buttons to a series of Maya commands (the same applies to other packages, of course) using the 3DxWare driver. Then, rather than being limited to keystrokes, you can easily hook the radial buttons up to open certain windows, for example the Outliner or the Graph Editor. It may seem like a small thing but using this in conjunction with the gestures really does create a sense of movement as opposed to having to constantly click, click and click.

ABOVE Using the CadMouse brings more bang to your clicks, and it's comfortable to use too

In addition, there are the two buttons on the thumb side of the mouse that can also be mapped to commands of your choice, or by default, left to handle zooming in or out of the scene (in Maya anyhow). We also found the CadMouse useful in other packages such as Firefox and Microsoft Word, where its use almost became instinctive. For example, in Firefox we wanted to go back a page, and without thinking we clicked on one of the buttons using our thumb, not knowing that's exactly what it would do. All in all, it really feels like a great deal of thought has gone into not only being able to set up the mouse to suit individual preferences, but also in how it can work very naturally in a multitude of packages.

One downside for some would be the wires, and as a commuter, a wireless version would be a bonus. However, with all the plus points listed above, what's a little nice wire between friends?

Jahirul Amin

ABOVE The CadMouse from 3Dconnexion is larger in size than your typical mouse

BELOW Connecting the radial buttons to Maya commands is easy, making the transition seamless

Essential info

Price	£79 ex VAT / $99
Website	3dconnexion.co.uk
OS	Windows 7, 8 and Vista
Buttons	7 total (including dedicated middle-mouse button, quick zoom, gesture / radial menu button)
Sensor	8200dpi / 1000Hz laser sensor
Wheel	Smart scroll
Cable	2m braided USB
Mouse feet	PTFE

Summary

★★★★½ **Features**
★★★★★ **Performance**
★★★★★ **Design**
★★★★½ **Value for money**

Verdict ★★★★★

A fantastic little product, recommended for anyone who dabbles in or out of 3D applications

Beginner's Guide to Character Creation in Maya

Jahirul Amin has written an invaluable book for anyone wanting a solid Maya foundation

With so many 3D Artist tutorials already under his belt as well as years of experience as an associate lecturer for the UK's National Centre for Computer Animation, Jahirul truly is one of the most talented Maya educators around today. Currently working as 3D trainer at Double Negative, his venture as the author of a whole book centred on Maya character creation is something every aspiring CG artist should be excited about.

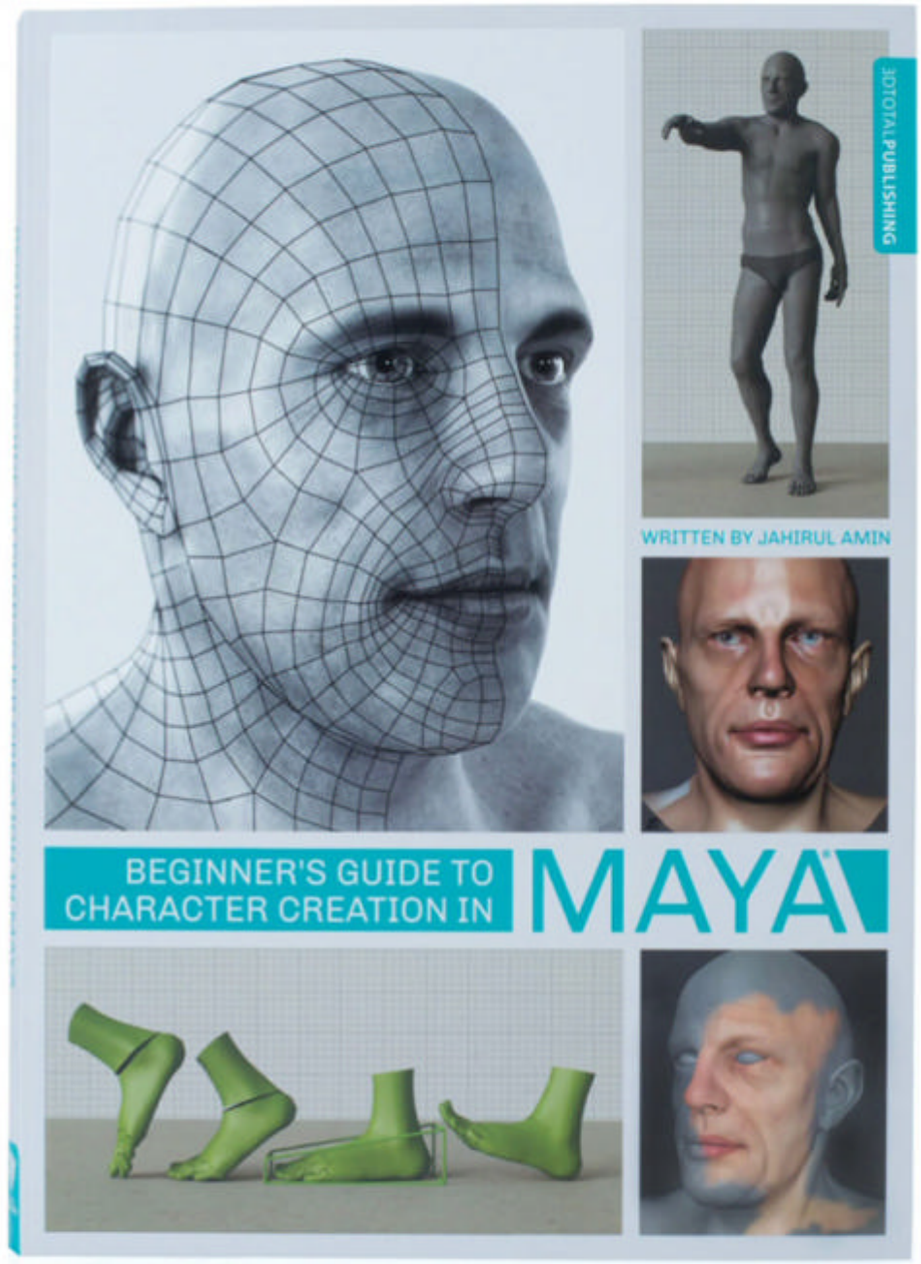
The book itself starts more like a general introduction to Maya and 3D than specifically character creation, assuming the reader is completely new to the whole industry. There's an entire chapter dedicated solely to explaining the 3D pipeline and the Maya interface, including an in-depth look into every Maya shelf and menu bar.

The remainder of the guide is very elegantly organised. Chapters on modelling, texturing and shading, rigging, animation, and lighting and rendering take readers through the entire character creation pipeline. First, the real-world theories behind what you're trying to do in each chapter are explained. You get a guide to human anatomy, muscles, body fat and proportions at the start of the modelling chapter, and one on joint mechanics at the start of the rigging chapter, for example.

Next, Jahirul takes things into Maya and showcases the most commonly used tools for each area of the pipeline using simple primitives.

Finally, everything you've learned is then used for a more complex Maya project: going from a cube to a Maya base mesh and then to a realistic model, retopology, generating and fixing UVs, texturing, rigging, weight painting, animating a walk cycle, then lighting and rendering Jahirul's realistic human character on the front cover.

The only confusing aspect was that after box modelling the base mesh for Jahirul's character, the section on sculpting realistic anatomy on top of the base mesh using Mudbox does not come next, but is rather at the back of the book. Also, note that Jahirul does use other packages like Mudbox for the sculpting and some texturing, as well as NUKE for compositing, so you will need access to these or similar packages to follow his exact full pipeline.



ABOVE Free resources are available to download at **3dtotalpublishing.com/resources** including videos, documents, files and more to go with the practical sections of the book

ABOVE Jahirul's passion for rigging is clear with the depth he goes into – he shows you how to add rib cage joints as well as automatic breathing control for characters using expressions

These are all very minor details in what is one of the most excellent books in Maya you can buy. Jahirul's enthusiasm comes through in every page, and his approach encouraging beginners to have fun with the software is fantastic. With this book, you won't be afraid to open up Maya, customise the UI and experiment with every button as soon as you start reading – resulting in a very solid foundation in Maya by the end.

Larissa Mori

Essential info

Price	£29.99 / $49.99
Publisher	3DTotal Publishing
Website	3dtotalpublishing.com
Author	Jahirul Amin
ISBN number	978-1-909414-20-4

Summary

Quality ★★★★½
Accessibility ★★★★★
Overall usefulness ★★★★★
Value for money ★★★★★

Verdict ★★★★★

An excellent, clearly written book. Invaluable for all beginners and those about to undertake a CG course

3DArtist SPECIAL SUBSCRIPTION OFFER

TRY 5 ISSUES FOR £5*

OVERSEAS READER SPECIAL
6 ISSUE OFFER*

INCREDIBLE STEP-BY-STEP TUTORIALS

EXCITING, INDUSTRY-LED FEATURES

ORDER HOTLINE
0844 249 0472
Calls will cost 7p per minute plus your telephone company's access charge

ONLINE AT
www.imaginesubs.co.uk/3da

EVERY ISSUE PACKED WITH...

- **Exclusively commissioned art**
- Behind-the-scenes guides to images and fantastic artwork
- **Digital downloads of amazing assets**
- Interviews with inspirational artists
- **Tips for studying 3D or getting work in the industry**
- The chance to see your art in the mag!

WHY YOU SHOULD SUBSCRIBE...

- **Try 5 issues for £5***
- **Save 40% off future issues** - paying £21.60 every 6 issues
- **FREE delivery** direct to your door
- **Never miss an issue**

ORDER BY

31 AUGUST 2015

Use code **SUMMER151** for this offer

BY POST

Send your completed form to:
3D Artist Subscriptions, 800 Guillat Avenue,
Kent Science Park, Sittingbourne, Kent ME9 8GU

YOUR DETAILS

Title_____ First name_____

Surname_____

Address_____

_____

_____

Postcode_____ Country_____

Telephone number_____

Mobile number_____

Email address_____

DIRECT DEBIT PAYMENT

☐ **UK Direct Debit Payment**

I will receive my first 5 issues for £5, then I will pay only £21.60 every 6 issues thereafter

Instruction to your Bank or Building Society to pay by Direct Debit

DIRECT Debit

Please fill in the form and send it to: Imagine Publishing Limited, 800 Guillat Avenue, Kent Science Park, Sittingbourne, Kent, ME9 8GU

Name and full postal address of your Bank or Building Society

To: The Manager — Bank/Building Society

Address

Postcode

Name(s) of account holder(s)

Branch sort code

Bank/Building Society account number

Originator's Identification Number: 5 0 1 8 8 4

Reference Number

Instructions to your Bank or Building Society
Please pay Imagine Publishing Limited Direct Debits from the account detailed in this instruction subject to the safeguards assured by the Direct Debit guarantee. I understand that this instruction may remain with Imagine Publishing Limited and, if so, details will be passed on electronically to my Bank/Building Society

Signature(s)

Date

Banks and Building Societies may not accept Direct Debit instructions for some types of account

A6 instruction form

PAYMENT DETAILS

YOUR EXCLUSIVE READER PRICE, 6 ISSUES

☐ **EUR £32** ☐ **ROW £37** ☐ **USA £37**

Cheque

☐ I enclose a cheque for £_____
(made payable to Imagine Publishing Ltd)

Credit/Debit Card

☐ Visa ☐ Mastercard ☐ Amex ☐ Maestro

Card number

Expiry date

Issue number __ (if Maestro)

Signed _____

Date _____

Please tick if you do not wish to receive any promotional material from Imagine Publishing Ltd by post ☐ by telephone ☐ via email ☐

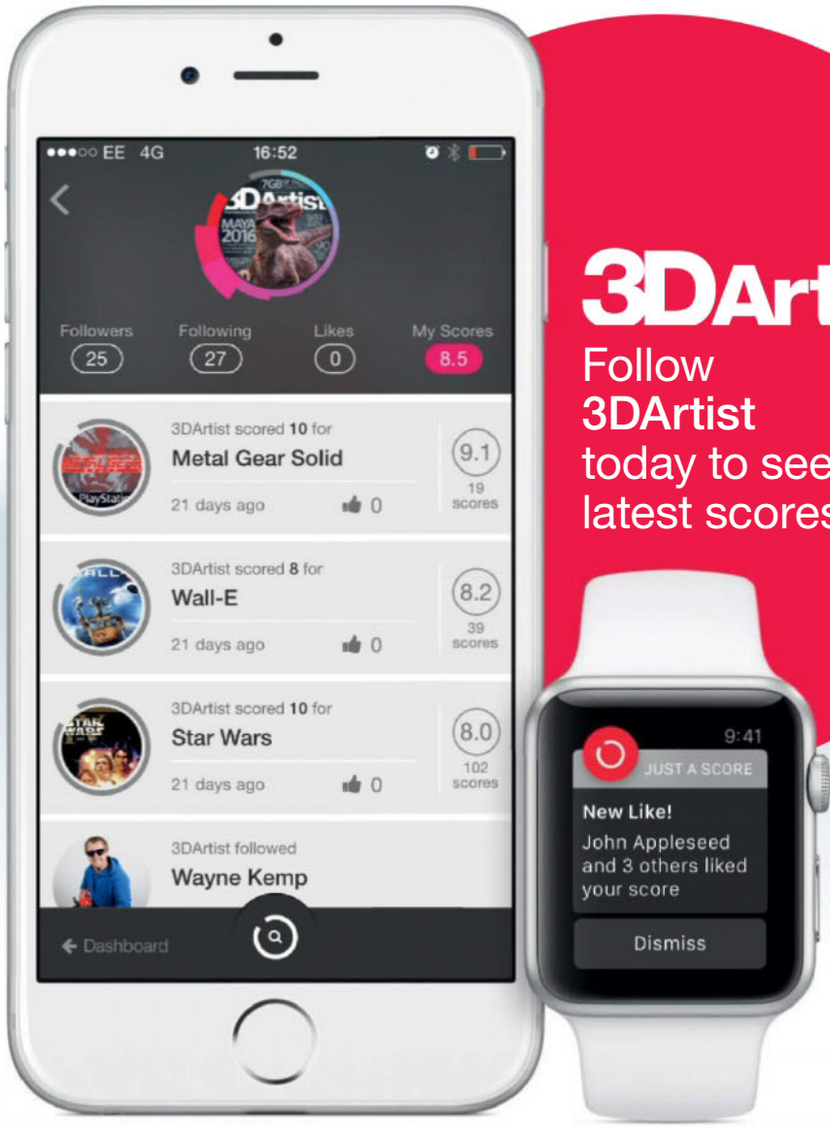
Please tick if you do not wish to receive any promotional material from other companies by post ☐ by telephone ☐ Please tick if you DO wish to receive such information via email ☐

TERMS & CONDITIONS

*This offer entitles new UK Direct Debit subscribers to receive their first 5 issues for £5. After these issues, subscribers will pay £21.60 every 6 issues. Offer code SUMMER151 must be quoted to receive this special subscription price. New subscriptions will start with the next available issue. Details of the Direct Debit Guarantee are availble on request. This offer expires 31 August 2015.

Follow 3DArtist on JUST A SCORE

THE FREE NEW SCORING NETWORK



3DArtist

Follow **3DArtist** today to see our latest scores

- It's completely free
- **Get the latest review scores**
- Get involved with the team
- **Give your opinion instantly**
- Like and share scores
- **Score anything in the world**
- Follow a range of scorers for your favourite topics

SCORE ANYTHING JUST A SCORE

Download on the App Store

3DArtist

PICK OF THE SCORES...

Score your favourite art

You can score absolutely anything on Just a Score. We have been scoring all of our favourite software, hardware, movies and videogames. What's your Just A Score?

- 10 — 3DArtist scored **10** for ZBrush 4R7
- 10 — 3DArtist scored **10** for Nvidia M6000 Quadro
- 8.0 — 3DArtist scored **8** for AMD FirePro W7100
- 8.0 — 3DArtist scored **8** for Lenovo ThinkStation P500
- 8.0 — 3DArtist scored **8** for Houdini 14

The Hub

The inside guide to industry news, VFX studios, expert opinions and the 3D community

> "As a recent report announced Bournemouth as the fastest growing digital economy town in the UK, Bournemouth town centre is perfect for the VFX conference"
>
> **Sofronis Efstathiou,** BFX festival director

090 Community news

BFX begins

Discover more about the workshops, talks and screenings taking place at this year's BFX festival – tickets are now on sale

092 Industry news

3D Make & Print

We release a new 3D printing title and get a sneak peek into KeyShot 6 and KATANA 2

094 Social

Readers' Gallery

The latest images created by the **3dartistonline.com** community

To advertise in **The Hub** please contact Simon Hall on **01202 586415** or **simon.hall@imagine-publishing.co.uk**

Miles Green from Animalogic gives a presentation at a previous BFX festival

Tickets now on sale for BFX 2015

The student-led computer animation and VFX event is coming back to the South Coast this September

ABOVE The BFX festival showcases the visual effects and animation industry and fresh UK talent too

First launched in 2012 by the UK's National Centre for Computer Visualisation and Animation at Bournemouth University, BFX offers an incredibly unique take on your typical VFX event.

It all begins when throughout the summer, a nation-wide competition provides the opportunity for student and graduate teams to battle it out – discovering who can produce the best short animation or VFX sequence in just seven weeks. With help from industry mentors at studios like Framestore, Double Negative, ILM London and The Mill, the teams will have to produce their work for real clients including the Anthony Nolan Trust and Dyslexia Action. By the end, winners will be walking away with internships at leading UK film and visual effects studios.

Everyone else can gain access to the remaining three parts of the festival from 16 September. A two-day academic conference will let you explore the theoretical aspects to creative practices and production methods, while workshops running until 4 October will give exclusive access to tutoring by some of the best creative minds in the industry.

Finally, the Festival itself consists of a unique programme of presentations, tech demonstrations, public screenings and family friendly events to get more and more people interested in how the art on screen is made, as well as a careers hub that will feature recruiters from companies from all around the world.

"This year's BFX Festival is going to be the best one yet, full of talks, workshops and hands-on activities that promote the best UK and international talent in the film and gaming industries," says BFX Festival director Sofronis Efstathiou. "The UK has an amazing reputation for the quality of its visual effects work, and it's great to have a Festival like BFX in the UK to celebrate the work going on in this field. Last year we had Oscar-winning films being showcased, and artists who worked on some of the best films and games of the last decade. We are planning for this year's Festival to have the same flavour; it is definitely not one to miss!"

If last year's event is anything to go by, attendees will have access to presentations covering many of this year's blockbuster films, games, ads and television shows, as well as a family focused set of animation activities to inspire the next generation of CG artists.

Workshops will hopefully also be as good as last year, which saw free Maxwell Render and RealFlow training from Next Limit, as well as an illustration and sculpture workshop from *Discwold* book jackets illustrator Paul Kidby and character design and anatomy workshops by the great Scott Eaton, whose work is on the cover of 3D Artist Issue 54.

"As a recent Tech Nation report [done by Tech City UK] announced Bournemouth as the fastest growing digital economy town in the UK, Bournemouth town centre is the perfect place for the VFX conference," Efstathiou continues. "This Festival has something for everyone, from VFX industry professionals to hobbyists; from film-lovers to children who want to learn more about animation."

Tickets are now available for the five-day festival, with both passes to the whole event as well as single-day passes on offer. Family passes that let one parent and two children under 18 to attend for £30 are available, as well as a small number of Early Bird tickets and group discounts. For more information on what to expect from BFX, visit the Festival's website at bfxfestival.com.

ABOVE The festival will take place at Bournemouth's BIC (**bfxfestival.com/festival/festival-map**)

BELOW Students discover the companies that could start their careers at the 2014 BFX Festival

> It's great to have a Festival like BFX in the UK to celebrate the work going on in the [visual effects] field
>
> **Sofronis Efstathiou, BFX Festival director**

Sofronis Efstathiou poses with students helping out at the 2014 festival

Q&A with Sofronis Efstathiou

The BFX Festival director tells us all about the all-important additions to this year's conference

What is new for BFX in 2015?
This year we are introducing an extra day to the Festival called BFX Pro. Aimed at professionals, BFX Pro will attract CTOs, CEOs, pipeline engineers, software developers and service providers. With the help of The Foundry who are curating and sponsoring the event, the Pro day will seek to explore and connect research results with real-world industry requirements; a platform from which we can discuss new technologies and services whilst debating their development and application in the near future. Themes for the day will include 'AR & VR – The Reality of Virtual Content', 'Tools for Iteration and Collaboration – Pipeline empowers Creativity' and 'Invisible Technology – The Backbone of the Future'.

Can you tell us more about this year's workshops?
This year's workshops will be bigger than any previous year – starting on the weekend prior to the festival and taking place across all nine days. We will have the very best speakers delivering a variety of workshops, seminars and tech demos, including talks from concept artists, riggers, animators, modellers, scriptwriters and software developers. Some sessions will be free, others will have a small charge to help support the event. Follow us on Twitter @**BFXFestival** to keep up to date.

What can attendees expect to learn from the Academic Conference?
This year's theme is 'Analogue to Post-Digital', in which participants are invited to consider the trajectories of these movements as we engage in a discourse of the 'post-digital' in still and moving image. Embedded within this is a range of themes such as: memory and the archive, media archaeology, hybridity, intermedia practices, folksonomies and virtual curatorship, the network, new pedagogies and education design.

Brad Peebler, Bill Collis, Nic Humphries and Simon Robinson on the verge of The Foundry's new future with HgCapital

The Foundry reveals its new owner

Along with releasing MODO 901 and KATANA 2, The Foundry has a new majority owner – and it's not Adobe

A selection of the new features

MODO 901 • Advanced viewport that enables users to manipulate geometry and materials in a real-time setting, all while displaying lighting, shadows, BFDF materials, reflections and more • Award-winning MeshFusion, $395 in value, is now included as standard • Extended dynamics and effects including a new procedural Shatter item for automatically shattering meshes based on collisions and a procedural Rock toolset • Layered multiresolution sculpting • More flexible rigging

KATANA 2 • New core engine introduces Ops, which provide greater power, flexibility and ease of use • Lua scripting so artists can manipulate data from within the UI • Scripting support for math operations • New scene graph data API • Multithreaded scene data generation for increased performance when working with renderers like RenderMan and Arnold • Enhanced Live Rendering for both lighting and look development

After several rumours that it would be bought by Adobe or Autodesk, The Foundry has now announced a majority investment from HgCapital; all in the same month as releasing both MODO 901 and KATANA 2.

As one of the UK's most prestigious private equity firms, HgCapital will assume the majority ownership from investment firm The Carlyle Group for an enterprise value of £200 million.

"Knowing the direction we plan to take The Foundry, we identified that HgCapital was the ideal partner to build on what The Carlyle Group have helped us achieve," said Bill Collis, The Foundry's chief executive officer. "Nic [Humphries of HgCapital] and his team have such deep software experience, take a long-term view on investing and have an amazing track record in taking already solid companies to even greater levels of success. HgCapital achieve this through investment, both in R&D and people, with a deep respect for customer loyalty and satisfaction."

"With this deal, we remain one of the few independent companies solely focused on creative industries. This lets us pursue our best in-class strategy; prioritising research and innovation, and teaming with other companies to create powerful collective solutions."

Autodesk and Microsoft pair up for 3D

Will we see Autodesk 3D printing in Windows and models in HoloLens soon?

Autodesk has launched some exciting new initiatives with none other than Microsoft in a huge shift towards 3D printing and augmented reality.

First, Autodesk's open-source 3D printing software and hardware-building platform, Spark – which was initially announced along with the company's own stereolithography printer in 2014 – is now going to actually be embedded directly into the Windows 10 operating system.

The Microsoft developer community will also have free access to Spark APIs to be able to build upon the tool and expand it further.

Meanwhile, another initiative will aim to bring 3D models from Autodesk software into the virtual reality environment of Microsoft's newly announced HoloLens, so that artists can view 3D models as though they were already in the real world before prepping them for 3D printing on Spark-compatible printers.

For more information, visit **autodesk.com** or **spark.autodesk.com**.

Autodesk is also joining Microsoft as a founding member of a 3D Manufacturing Format Consortium

HAVE YOU HEARD? Framestore has announced it will increase its presence in Montreal, creating 150 new jobs

Tyroe.com launches

This portfolio and job application system could change how aspiring artists enter the industry

Created by Andrew McDonald and Alwyn Hunt, the two founders of the CG Student Awards, Tyroe.com promises to be a website that will let junior artists – that is anyone with less than five years of industry experience – stand out to the world's leading production studios. "At present there are countless well-established portfolio systems and job boards available online and, let's face it, the market is flooded," says Andrew McDonald. "However, the problem is that these sites are all aimed at top-end professionals with killer portfolios and glowing LinkedIn profiles with more film credits than Samuel L Jackson."

Once a portfolio-based profile is set up, any junior artist will instantly become visible to recruitment teams who may be searching for talent, as well as gain reviews on their work and an industry score to rank them and increase the possibility of being hired.

Learn more about how Tyroe works at **tyroe.com**, and apply for jobs with one click

Grab your copy of the first issue of **3D Make and Print** from the Imagine Shop today at **imagineshop.co.uk/3d-make-print** for just £9.99!

Rebelle 1.0 is released

Escape Motions' new painting program creates results that look like real watercolour and acrylic

Inspired by real-world painting, Rebelle has been designed from the ground up to be the closest a digital tool has ever come to the flow, spontaneity and feel of traditional materials.

Users can paint, smear, rewet dried colors, blow wet washes across the paper, tilt the paper to create water drops and runs, as well as combine everything from watercolours, acrylics or ink pen with tools like pastels, pencils or any other dry media.

Key features include a unique watercolour algorithm that simulates the physics of fluid, an intuitive interface, a new image import, a transform layer tool and an image-tracing tool in version 1.0. Rebelle is available for Windows and Mac OS X for $59.99 on the Escape Motions website at **escapemotions.com**. A Mac App Store edition will be available soon.

'Never Bored' by Tim Shelbourne showcase Rebelle's excellent mimic of watercolour

3D printing magazine launch

From the team behind 3D Artist comes 3D Make & Print, a new title for passionate printing fans

Starting from an introduction to all the different printing technologies there are out there, this ultimate guide to 3D printing will take you through all you need to know about one of the hottest areas of tech today.

You will get to explore the industries in which 3D printing is changing things for good including medicine and robotics, and learn the surprising history behind the technology before finding the perfect machine to use at home with an in-depth guide to the best desktop printers on the market for every budget. Over 50 pages of start-to-finish 3D printing project tutorials and 100 free models also come included!

Software shorts

Bringing you the lowdown on product updates and launches

Polygonify 3D modeller

Polygonify is a 3D modelling tool available exclusively for the iPhone and iPad, so that any 3D artist can easily start the modelling or blocking process wherever they go using a mobile device. The model can then be exported to software packages such as ZBrush and Maya for further processing or 3D printing. For more information visit **polygonify.com**.

HDR Light Studio 5

Lightmap has made HDR Light Studio 5 available, featuring a new flexible UI, support for Alembic, Instant Re-lighting and the patented 'click-to-light' system that lets artists place lights directly into a render view and get instant progess updates. New pricing starts at £695 for permanent licences and £295 for annual subscriptions. Learn more at **lightmap.co.uk**.

Mixamo 2.0

Automatically create, rig or animate your characters ten times faster than ever before with the new Mixamo 2.0, which now includes a plugin-free viewer, customisable animation packs and much more. Mixamo Inc has now even announced free autorigging for Fuse characters to celebrate, down from $50 per autorig. Read more at **mixamo.com**.

DID YOU KNOW? ILM is 40-years-old, with a history of 300 film contributions and 15 Academy Awards in visual effects

Images of the month

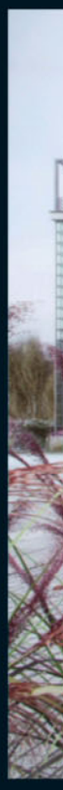
These are the 3D projects that have been awarded 'Image of the week' on 3DArtistOnline.com in the last month

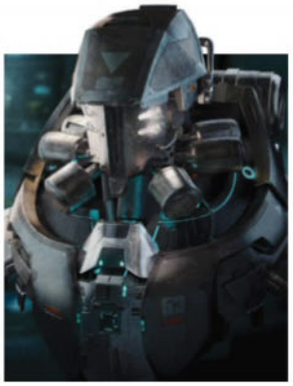
01 Heart of Eden
by Tomi Väisänen
3DA username Tomivaisanen
Tomi says: "A group of Finnish digital artists held an exhibition in central Helsinki. I was asked to create an image for this event. Structures and machinery was done with a standard poly modelling workflow. Vegetation is a mixture of models and photos."
We say: *A lot is going on here, and we love the amalgamation of plant and machine. The particle effects are great.*

02 Bugatti 3D Concept
by Shavarsh Nazaretyan
3DA username Origin88
Shavarsh says: "Car design is my favourite class, and this concept car was inspired by the Italian masters of design. I have a dream that in the future I'll be able to see my concept cars in reality."
We say: *Crisp, clean and beautiful, Shavarsh's Bugatti concept is easy on the eye. This is a superb example of hard-surface modelling and lighting.*

03 Mr Grumpy
by Lars-Gunnar Thorell
3DA username Dstort
Lars-Gunnar says: "I have always been drawn to film noir and dark, atmospheric imagery, and I wanted to bring those elements into this portrait."
We say: *We also have a thing for dark and atmospheric imagery, which is why we fell in love with this image straight away. The face is atypical of traditional film noir characters too. This image is beautifully lit and the skin and cloth textures are fantastic.*

04 Narkomfin Building
by Nikolaev Rostislav Igorevich
3DA username archirost
Nikolaev says: "This project is a 3D reconstruction of a legendary example of Soviet avant-garde architecture – Narkomfin in Moscow. This is an architectural monument of constructivism."
We say: *This captures the look and feel of this period of Soviet architecture perfectly. We love the flashes of colour and the reflectivity of the glass.*





Sci-fi MECH
by Alessandro Leto Colombo
3DA username theForp

Alessandro says: "I found a great concept by Andrian Luchian and fell in love with it. The hardest, and at the same time most fun part, was to model all those details without losing the clean shape of the armour. I've learned a lot with it."
We say: *The detail is fantastic – we love the scratches and degradation on the armour and the blue lights that add a neat, futuristic flourish.*

An Evening in Paradise **by Andrei Shah**
3DA username AndreiShah

Andrei says: "CGI provides the medium to create any environment you wish and for the last few months, that place for me was an evening in paradise."
We say: *Andrei's image really conjures a warm, holiday feeling. Relaxing and well composed – great stuff.*

Old Kitchen **by António José M Castro**
3DA username Antonio Castro

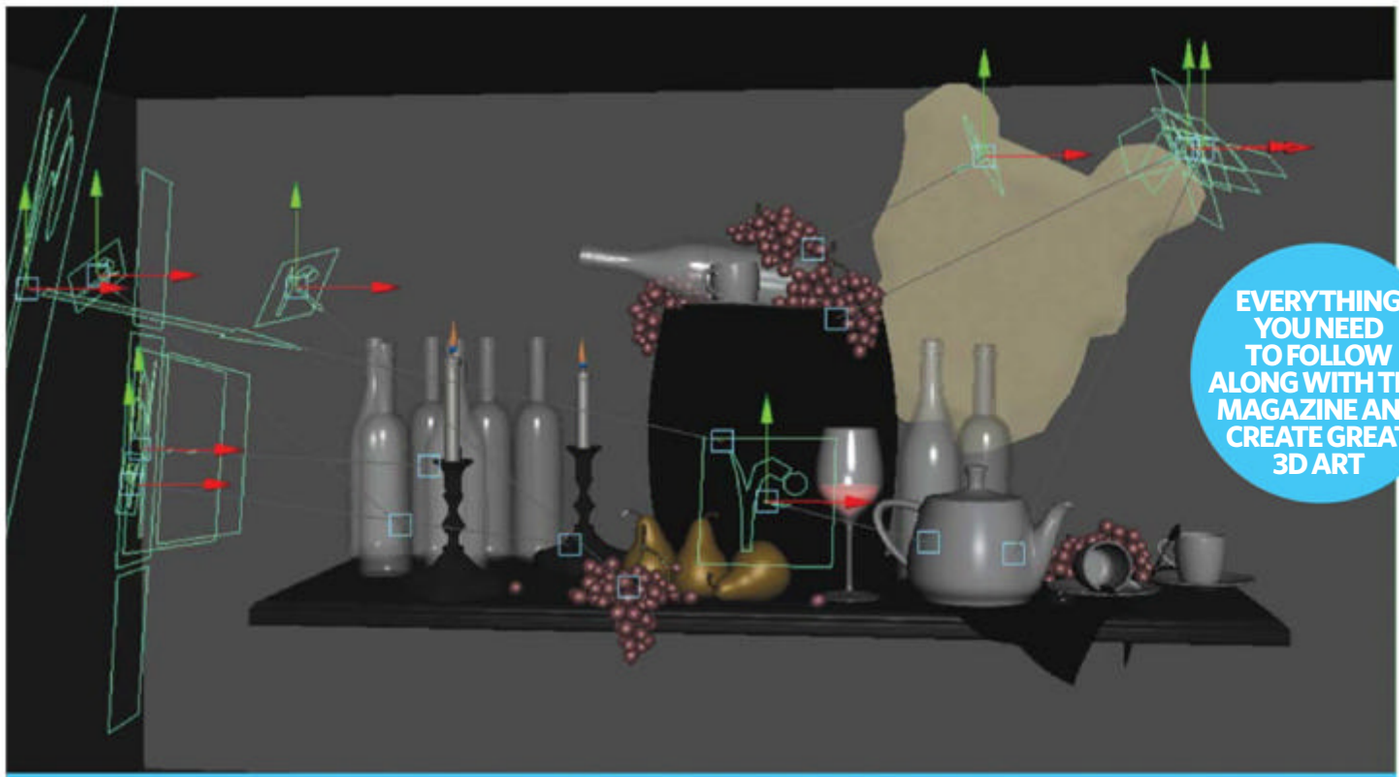
António says: "This is a personal project for study and improvement, which is based on several small notes that I find all over the place – mostly the internet and interior design magazines. My thanks to everyone who helped me make it happen."
We say: *More great arch-vis here with a rustic scene that feels immensely homely. The old tiling and the grease marks on the pans feel really authentic.*

Goatsen, Captain of Miurr **by Angel Nieves**
3DA username vertexangel

Angel says: "This fantasy-themed image is a portrait of a military captain of the fictional city of Miurr. I write little background stories for my images – it helps me to give them depth."
We say: *Angel has done really well with his sculpting here and has achieved some lovely detail in his character's face. A lot of artists tell us that a backstory can really help when designing a character – it might be of use to you in your work, too.*

YOUR FREE RESOURCES

Log in to **filesilo.co.uk/3dartist** and download your 3D resources **NOW!**



EVERYTHING YOU NEED TO FOLLOW ALONG WITH THE MAGAZINE AND CREATE GREAT 3D ART

RENDERMAN SCENE FILES FROM PIXAR

25 3DTotal textures

CGAxis models

Digital-Tutors ZBrush videos

THIS MONTH'S COMBINED RESOURCE SIZE: **13GB**

filesilo.co.uk/3dartist

YOUR BONUS RESOURCES

ON FILESILO THIS ISSUE, FREE AND EXCLUSIVE FOR 3D ARTIST READERS, YOU'LL FIND 13GB OF RESOURCES, INCLUDING...

- Over two hours of ZBrush video tuition from the experts at Digital-Tutors
- Premium CGAxis models worth over $90
- A selection of HDRIs courtesy of HDRI Hub
- 25 awesome 3DTotal textures
- Trial version, assets and exclusive discount for Golaem Crowd
- A huge selection of images, videos and files from our tutorials, including RenderMan scene files courtesy of Disney Pixar

FileSilo

FILESILO – THE HOME OF PRO RESOURCES

Discover your free online assets

- A rapidly growing library
- Updated continually with cool resources
- Lets you keep your downloads organised
- Browse and access your content from anywhere
- No more torn disc pages to ruin your magazines
- No more broken discs
- Print subscribers get all the content
- Digital magazine owners get all the content too!
- Each issue's content is free with your magazine
- Secure online access to your free resources

This is the new FileSilo site that replaces your disc. You'll find it by visiting the link on the following page

The first time you use FileSilo, you'll need to register. After that, you can use your email address and password to log in

The most popular downloads are shown in the carousel here, so check out what your fellow readers are enjoying

If you're looking for a particular type of content, like software or video tutorials, use the filters here to refine your search

Can't find the resource you're looking for in these filters? Click on More Types to specify what kind of resource you want

Green open padlocks show the issues you have accessed. Red closed padlocks show the ones you need to buy or unlock

Top Downloads are listed here, so you can get an instant look at the most popular downloaded content

Check out the Highest Rated list to see the resources that other readers have voted for as the best

Find out more about our online stores, plus useful FAQs such as our cookie and privacy policies and contact details

Discover our fantastic sister magazines and the wealth of content and information that they provide

HOW TO USE FileSilo

EVERYTHING YOU NEED TO KNOW ABOUT ACCESSING YOUR NEW DIGITAL REPOSITORY

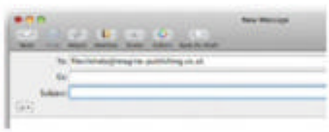
To access FileSilo, please visit **filesilo.co.uk/3dartist**

01 Follow the on-screen instructions to create an account with our secure FileSilo system, and then log in and unlock the issue by answering a simple question about the magazine. You can access the content for free with each issue of 3D Artist.

02 If you happen to be a print subscriber, you can easily unlock all the content by entering your unique Web ID. Your Web ID is the eight-digit alphanumeric code that is printed above your address details on the mailing label of your subscription copies. It can also be found on any renewal letters you receive.

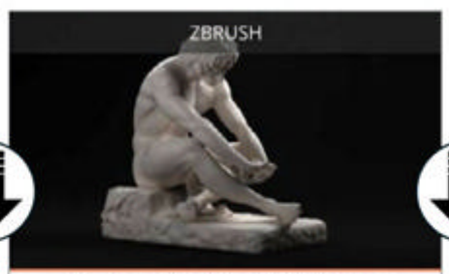
03 You can access FileSilo on any desktop, tablet or smartphone device using any popular browser (such as Safari, Firefox or Google Chrome). However, we recommend that you use a computer to download content, as you may not be able to download files to your phone or tablet.

04 If you have any problems with accessing content on FileSilo, or with the registration process, take a look at the FAQs online or email **filesilohelp@imagine-publishing.co.uk**.



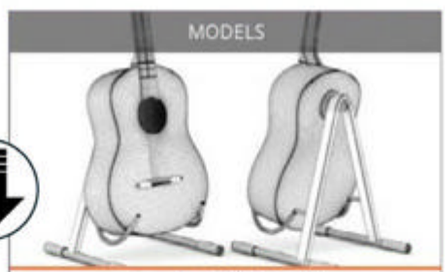
Create still life with RenderMan

Included with this download are exclusive Pixar scene files and assets to...



Techniques for Sculpting Like the Masters in ZBrush

Join the experts at Digital-Tutors as they delve into some essential sculpting...



5 premium CGAxis models

Included in this pack are five awesome musical instrument models, perfect for...

NEED HELP WITH THE TUTORIALS?

Having trouble with any of the techniques in this issue's tutorials? Don't know how to make the best use of your free resources? Want to have your work critiqued by those in the know? Then why not visit the **3D Artist** Facebook page for all your questions, concerns and qualms? There is a friendly community of fellow 3D artists to help you out, as well as regular posts and updates from the magazine team. Like us today and start chatting!

facebook.com/3DArtistMagazine

Issue 83 of **3D Artist** is on sale **15 July 2015** from **GreatDigitalMags.com**

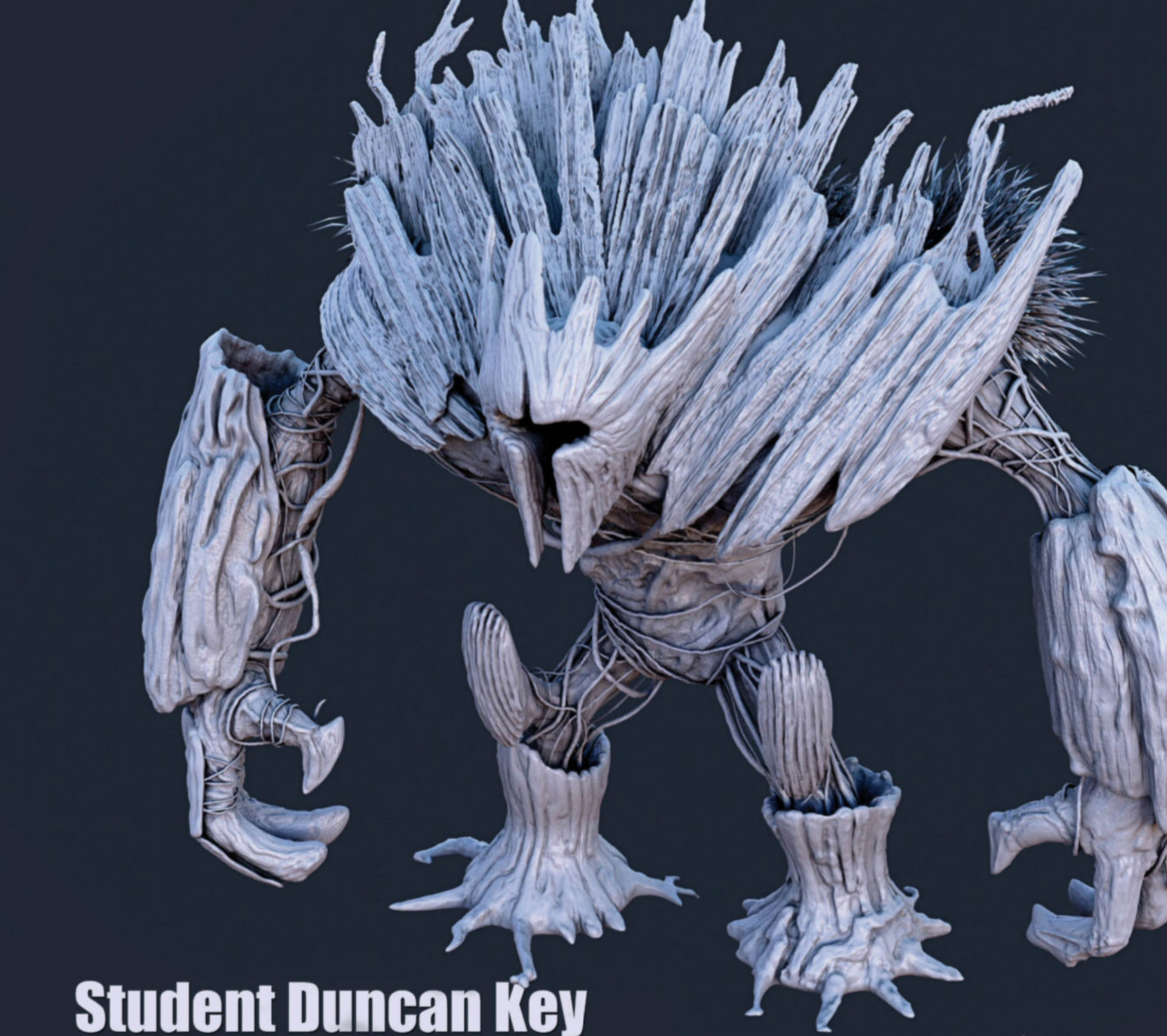
Image courtesy of Steve Barrett

MODO® 901

Create Something.

THE FOUNDRY.

www.thefoundry.co.uk



Student Duncan Key
MADE THIS IN WEEK 10!

Concept Designer
Grant Gosler

We're not sure which is cooler, the fact that Duncan made this in the 10th week of DAVE School (with no prior training) or the fact that this was the second ZBrush project assigned to his class! Our students benefit from being assigned carefully planned projects with expert instruction so they are doing amazing work right out of the gate!

They are provided with world-class designs from notable concept artists and shown professional techniques, but how they use their newly acquired skills is entirely up to them. The DAVE School never provides step-by-step instruction, we push the student to find their own way through a challenge, just like they will when they go to work at a studio.

And while we are proud of Duncan, he's by no means the only one. Check out our student galleries and you will see page after page of consistently great work from a wide variety of students! Our modeling program is common to both our 12-month **VFX Production** program and our 15-month course in **Game Production.**

DAVE SCHOOL

The Digital Animation & Visual Effects School

www.DaveSchool.com

The DAVE School is located on the backlot at **UNIVERSAL STUDIOS®** in Orlando, Florida!

THE DAVE SCHOOL IS NOT OPERATED BY NOR AFFILIATED WITH UNIVERSAL ORLANDO®